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EDITORIAL.

A UNIFORM CODE of mine signals, as proposed in another column of this JOURNAL, constitutes a reform in mine practice to which we are glad to give our hearty endorsement. Such improvements are born of actual necessity. Instances are not wanting of serious accidents which might have been avoided by some such comity of action. Indeed, South African experience alone is sufficient evidence to the need and the efficiency of such reform. Probably there will be but little diversity of opinion as to the desirability of a uniform code. The engineer and the arm-chair critic will be at one on this matter. The next question is as to the machinery to set in motion whereby a representative and authoritative committee may be appointed to devise the signals which would be most generally appropriate and serviceable. The matter has come up for discussion, and we hope to elicit the attention and the promptly expressed opinion of a score of our leading engineers. As soon as natural interest shall have been aroused and focused on this matter, there will be no difficulty in referring the matter to the proper men, and with power for action. Meanwhile the columns of the JOURNAL are at the service of all suggestions for the insurance and safety of our engineers.

THE LETTER regarding the German coal strike, which is published in another column, reaches us as the strike is closing, but we give it because it contains explanations, by an observer on the spot, of some phases of the strike which have not been fully covered by the cable dispatches. It confirms the impression gathered from those dispatches that the public sympathy was generally with the strikers, and not with the Coal Syndicate.

REPORTS ARE revived of a consolidation of southern iron interests, the companies concerned being the Tennessee Coal, Iron & Railroad Company, the Sloss-Sheffield Iron & Steel Company, and the Republic Iron & Steel Company. The Republic Company has large interests in the Central West, as well as those which it controls in the South, and there is no intimation as to how these would be brought into the combination. The Tennessee and the Sloss-Sheffield companies once opened negotiations for a

consolidation, and about a year ago committees were appointed to value the properties of the two companies, but nothing further has been done. Should the combination be formed, it would constitute a very strong company, controlling by far the greater part of the southern output of pig iron, and practically all of the finished iron and steel made in that section. The result, however, is still very uncertain.

COAL-DUST AS A factor in mine explosions has been attracting a good deal of attention lately, and has drawn out a number of papers and discussions before various technical associations. In the course of these, many valuable facts and records of experience are being brought out. Some of these are abstracted elsewhere in this issue, and will, we think, furnish profitable reading. The best methods of preventing dust in mines are still under discussion, and will probably continue so for some time to come.

The importance of the subject is emphasized by the serious accident at the Virginia mine, in Alabama, which is recorded in our news columns. The telegraphic advices indicate that this accident was a dust explosion, and this seems probable, as the Alabama mines are not fiery as a rule. When fuller information is received as to this accident, we hope to take up the subject again.

A MOVEMENT HAS been inaugurated for the erection of a monument to the late Professor Franz Posepny, at his birthplace, Sharkenback in Bohemia. It will be recalled that the treatise of Prof. Posepny constituted the nucleus of the volume on 'The Genesis of Ore-Deposits,' published by the American Institute of Mining Engineers, the most recent, and almost the only, standard consensus of research and opinion on this subject. Great is the debt of mining geology to Posepny; his many admirers will be glad to embrace this opportunity to show, in a befittting way, their appreciation of indebtedness, and their gratitude. All friends are invited to attend the unveiling and dedication of this monument, which is scheduled for 1905, no special day being yet announced.

THE FAR EAST last year well sustained its traditional record as an absorber of silver. The shipments from London, which still remains the central silver market, showed a considerable increase, notwithstanding the fact that the adoption of the new currency system in the Straits caused a falling off of nearly 90 per cent in the quantity shipped there. The exports to India reflected the current prosperity in that country, showing a gain of 28.3 per cent, while those to China increased nearly 66 per cent, though they are still smaller than the takings of four or five years ago. The direct shipments from San Francisco, however, which go chiefly to China, showed a very large increase. In the following table we give the exports from London and San Francisco, as valued by the respective customhouses, adding the approximate quantity of silver as determined by the average price in each year. The table gives the total exports for 1904 with the changes from previous year:

	1904.		Changes
From London:			
India	£9,527,618	I.	£2,104,288
China	512,792	I.	202,732
The Straits	79,268	D.	742,611
Total	£10,119,678	I.	£1,564,409
App. ounces	92,000,600	I.	9,059,800
From San Francisco	$7,582,336	I.	$5,720,276
App. ounces	13,251,000	I.	9,775,400
Total, ounces	105,251,600	I.	18,835,200

Owing to the higher average price of silver in 1904, the increase in quantities shipped to the East is somewhat less in proportion than that in values. It is a fact, nevertheless, that the silver actually taken last year was more than twice the total production of the metal in the United States, and a very large proportion of the total output of the world. Evidently the East has not lost its old-time appetite for the white metal.

A SUIT which involves some rather difficult questions has been commenced at Bakersfield, in California. The complainants are owners of irrigating canals, which derive their water from the Kern river, and the defendants are the companies operating in the Kern River oilfield. The complaint is that the oil companies have bored numerous wells on lands adjacent to the natural channel of the river, and that, by means of powerful pumping machinery, they are drawing large quantities of water from the river for various purposes, decreasing its natural flow. The complainants ask for an injunction to restrain defendants from pumping water from the ground, unless such water is allowed to find its way back into the river. The entire natural flow of Kern river is covered by locations made by the various canal companies. The question will arise, doubtless, is the water drawn from the river, or does it come from underground channels which form no part of the stream? This will be a matter rather difficult of decision. The claims of the plaintiffs are supported to some extent by decisions made in certain cases, in southern California, but there are many points in which this suit is not entirely parallel. In carrying on work in the oilfields, large supplies of water are necessary, and if the operators are enjoined from using their wells, it will cause them much difficulty.

Spelter Production of the World.

The production of spelter in 1904 showed a very considerable increase; a greater one, in fact, than any other of the important metals. We have received from Henry R. Merton & Company, of London, their advance estimate of this production, which long experience in the trade has enabled them to make with a very close approach to accuracy. These figures are given in the table below for all countries outside of the United States. In the case of this country we have used, for 1903, the production as given in 'The Mineral Industry,' Vol. XII, and for 1904 the statement collected from producers and given in this JOURNAL for January 5 last. The figures given below are in long tons, of 2,240 lb. each:

	1903.	1904.	Changes.	
Belgium	129,000	137,780	I.	8,780
Rhine District	61,315	64,360	I.	3,045
Holland	11,515	12,895	I.	1,380
Great Britain	43,415	45,490	I.	2,075
France and Spain	41,780	48,310	I.	6,530
Silesia	116,835	123,695	I.	6,860
Austria and Italy	9,025	9,100	I.	75
Poland	9,745	10,440	I.	695
Total, exc. U. S.	422,630	452,070	I.	29,440
United States	141,519	157,901	I.	16,382
Total	564,149	609,971	I.	45,822

It will be seen that every producing country showed a marked gain in its output. For the European producers the total increase was 7 per cent, while the United States showed a gain of no less than 11.5 per cent, making the total increase in the world's supply last year, as compared with the previous year, 8.1 per cent. Outside of the United States the chief advances were in Belgium, Silesia, and in France, none of which, however, reached the same percentage of increase as our own country. The mining of zinc ores was extraordinarily active all over the world, and in some countries—as in

Spain—new deposits were opened and the demand for ores induced a great deal of prospecting.

The course of the metal last year indicates that consumption kept pace fully with production. Indeed, the gain in the use of the metal was probably somewhat larger than that in the supply, for there was, throughout the greater part of the year, an active demand with which producers were not always ready to cope; and the consequence was that the highest level of prices recorded for a long time was reached in the latter part of the year. At the present time there is every prospect of a continuance of this demand, and also of a further gain in production during the current year.

Amortization on the Rand.

In reviewing the history of gold mining operations in the Transvaal, one point which strikes the observer is that comparatively few, if any, of the companies have made any provision for the amortization of capital in any form. The principle is one which has often been discussed in our columns, and the best finance recognizes that a well-regulated mining enterprise should provide not only for current dividends on the capital, but also for its repayment when the deposit is exhausted. The Witwatersrand mines present peculiar opportunities for the proper application of this principle of amortization, since there is no other known gold-bearing deposit in the world where so close an approach can be made toward calculating the approximate life of an enterprise. Mr. J. H. Curle has called attention to this, in one of his recent articles on South Africa, and his suggestions are certainly to the point.

Possibly this would be a somewhat difficult matter to adjust, especially in the case of the outcrop mines first opened, which are now approaching the time of their exhaustion. Experience has shown that stockholders generally will not, or do not, provide individually for the re-payment of their capital, and that any arrangement of this kind must be the work of the managers of the company itself. It is a question which many directors are reluctant to approach, perhaps because they do not recognize its importance, while they may dread the effect upon the stock market of any curtailment of dividends, whatever the reason might be. Nevertheless, it is a question which ought to be taken in hand and seriously considered.

Whether such provision can best be made by an amortization fund, properly so called, or by the accumulation of a large cash reserve, which will enable a company to extend its life by the purchase of new properties, is a point to be decided by the circumstances in each case. The latter plan has been one most usual with British owned companies, but it has not been adopted by those operating in the Transvaal. Probably it is too late now for the older companies, but in the case of the deep-level mines there is certainly time for the consideration and adoption of plans looking to the future and to the amortization of the capital invested.

Annex Mining Schools.

The recent action of the trustees of the Colorado School of Mines, in considering an "Annex for Miners, Mill-Foreman, and Metallurgical Assistants," marks a notable movement. The resolution names a course of one year, for the limited number of twenty, who shall be *bona fide* residents of Colorado, and between the ages of 16 and 35. The intention is evidently to test the popular demand for a short 'practical' course. The plan is by no means new, having been well worked out at Freiberg, and being practically but unofficially recognized at several other schools, particularly in the case of applicants of worthy ability and ambition.

The conditions in the West may demand such an experiment. The State schools are supported by State funds; and however narrow or particularistic certain schools may have shown themselves, yet some, and the Colorado School of Mines in particular, have bravely maintained a high standard in what they had to offer. The problem is whether they have the money to cultivate this 'annex' proposition, and whether they have the poise and the foundation to cultivate it without detriment to the regular work. The matter of courting public favor and public funds by public service is always the problem of the public educator. The reputation of the degree of a school need not be discussed—it is a part of the problem, but it will care for itself. The first question asks, Can the annex scheme show the necessity for its existence that the regular course does? The second question asks, Is the regular course already provided with what it should have?—for instance, large-scale equipment in milling and metallurgy. We do not presume to answer these questions. The precedent in Germany may mean nothing—they know how to do things differently there. But, however commendable the general proposal for this annex may be—and we believe that it has some worthy considerations—one thing should be watched. Politics should be kept out of the motives and governance of the movement. Many of our best men are self-made, and some have had only a scanty special course such as that proposed would well provide. The senior Senator from Montana is said to have taken such a course; and, moreover, he seems to have applied it in a thrifty way; but such men would have found a way. Whatever may be the outcome of this experiment, it has its qualification in short-order popular service; it has its dangers in the cheapening and hindering of good regular instruction. Can these be worked together safely? The friends of engineering education will watch the issue with critical but friendly interest.

Gold Production of Australasia.

From our special correspondent, we learn that the gold production of the Commonwealth of Australia and New Zealand is estimated at 4,199,651 fine ounces as compared with 4,305,420 fine ounces in the previous year, thus showing a decrease of 105,769 ounces, or in value, of $2,186,245.

The following are the figures:

State or Colony.	1903. oz. fine.	1904. oz. fine.
Western Australia	2,064,801	1,983,231
Victoria	767,351	765,596
Queensland	658,176	624,917
New Zealand	479,746	466,440
New South Wales	254,260	269,817
Tasmania	59,891	66,400
South Australia	21,195	23,250
Total Australasia	4,305,420	4,199,651
Value	$89,993,031	$86,806,786

The total decrease was 2.4 per cent. Only the States of New South Wales, Tasmania and South Australia showed gains.

It will be noticed that this total for 1904 shows a difference of only 7,849 fine ounces from the preliminary figure given in our issue of January 5. The returns for the States of Tasmania and South Australia are estimated, but the other figures are compiled from official sources. Western Australia, it will be noted, is chiefly responsible for the recorded decrease, the shortage amounting

to 81,571 fine ounces. This State's contribution formed 47 per cent of the total production.

The State of Victoria shows only a slight decrease from the year 1903, but outside of the Bendigo field the returns compare unfavorably with those of the previous year. Bendigo shows an increase of 28.180 fine ounces, and Ballarat shows a decrease of 4,275 ounces. In Queensland, the decrease is even more pronounced, Mount Morgan alone having shown any increase. Charters Towers still remains in the lead, its production being nearly twice that of Mount Morgan, its closest competitor.

The returns from New Zealand are based upon exports only, which showed an unusual falling off during December. The figure, therefore, can not be taken as a criterion of the gold mining industry, which has in reality made very great progress during the year.

New South Wales, though contributing a smaller yield than the neighboring States, records a decided increase over the previous year. The declining tendency exhibited during the first ten months was more than counterbalanced by a marked improvement during the last two months.

THE METAL MARKETS this week show no important changes. Business continues good, and consumption is undoubtedly proceeding on a large scale, but there is no special activity.

In the iron markets, buying and new contracts are on a larger scale than for several weeks past, but the essential conditions are unchanged. Prices have been put up in several directions, bringing them back to the level of the latter part of 1903.

The coal markets, both East and West, have been seriously disturbed by bad weather and defective transportation resulting from the storms.

THE GIFT OF Mr. Simon Guggenheim to the Colorado School of Mines is only one of many items of public benevolence, which are becoming so common that they may easily slip away to the pigeon-hole of the statistician. The prominence of the donor in large mining activity is such that it emphasizes his confidence both in education in general and in the institution in particular. The far-reaching effect of this kindness is difficult to measure.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The atomic-volume of an element is the quotient of its atomic weight divided by its specific gravity in the solid state.

All metals, except hydrogen, are apparently opaque in the solid state. Really, they are feebly translucent, as is shown both by the color they give to reflected light and also by their color in thin films.

The modern theory of solution teaches that dissolved substances, if active acids or bases as salts, decompose largely into part-molecules called 'ions.' Ions were recognized by Faraday; but in his time they were supposed to exist only momentarily, as they were thrown out by the current, at the anode or cathode, respectively. It is now believed that 'free' ions exist all through the solution; but they are balanced and neutralized by the presence of others of the opposite kind. The ion is the part-molecule used in writing reactions of qualitative analysis.

Muntz metal is a brass alloy used for sheathing ships.

The ancients had the possibilities of hydrochloric, nitric and sulphuric acids in the three substances, green vitriol, niter, and common salt. The first on heating alone gives 'fuming sulphuric' acid; the first and second together give nitric acid; the first and third together give hydrochloric acid; and all three give the equivalent of *aqua regia*.

Beakers and flasks made of quartz have been introduced within the last year or two. They are very refractory and possess advantages over those made of platinum in that they are transparent, and the stoppers are not liable to become fused down. Moreover, they cost only one-tenth as much as those composed of platinum; but, on the other hand, they are brittle and fragile.

The German Coal Strike.

SPECIAL CORRESPONDENCE.

About 200,000 miners have been on strike in the Rhenish-Westphalian coal district for the last three weeks out of a total of 253,000, and this, of course, means a heavy loss, not only for mine-owners, but also for the whole industry. A considerable number of blast furnaces have been shut down, and the total number of men out of work is estimated at 300,000, which means that a total population of 1,200,000 souls is directly affected by loss of wages.

The general opinion is in favor of the strikers, and contributions are coming in freely from all parts of the country. Even the English trades-unions have allowed £2,000 per week for distribution among the workmen. The consequence is, that it is next to impossible to say how long the strike may last, and Belgian and English coal is shipped into Germany in large quantities.

There are three different unions of miners. One, the Socialist, is a purely political group; the next is the Christian group, and stands under the influence of the Catholic clergy; the third, the so-called *Gewerkschaften*, is a group of small combinations of crews from special mines, having no other object but the improvement of their social standing. Besides, there is a large number of miners not belonging to any of these unions; however, they comprise about two-thirds of the total number of miners.

Various reasons are given for this huge strike, and the main demands of the miners are the following: The time required to go down into the mine, and to come out again to be included in the shift; mine-cars carrying partly stone, instead of all coal, should no longer be deducted from the wages; better treatment on the part of the foremen, and better observation of the laws as to protection of the miners against accidents. The question of wages is of minor importance, although the fines are considered too heavy, and their reduction forms an item in the complaints.

The time required to get down into the mine and to get back to the surface used to be included in the shift of quite a number of mines, and the experiment at the Bruchstrasse coal mine, in introducing the same system, gave rise to the strike, because it meant an increase of the shift of about one hour.

The three groups named elected a committee of seven members to negotiate with the mine-owners' syndicate, but the latter refused point blank to meet this committee, as they did not want to deal with the representatives of the miners' associations. They would acknowledge only men appointed by, or selected from, the different crews, in order to trade independently for each mine. This is the point on which the government and general public are most in favor of the strikers.

The government has appointed a committee to make investigations and to act as arbitrator between the two parties, but the mine-owners again refused to meet this committee, and the probable consequence will be a new mining law, compelling the mine-owners to acknowledge the arbitration court of the government and settling the difficulties and complaints of the miners.

No riots occurred in the mining districts, and the labor unions formed a police of their own, which works a great deal better than the official police force.

The strike was finally closed through the intervention of the government, as already stated in our columns.

DISCUSSION.

Readers are invited to use this department for the discussion of questions rising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

THE COST OF MINING.

The Editor:

Sir—As Mr. Ingalls begins by saying in his recent article, the matter of the proper cost for mining is a hard subject to generalize, but I am of the impression that, if more companies published their cost in proper detail, the difficulty of generalization would be much less, because even in cases of wide difference of conditions, there would still be found operations in which the conditions were more or less parallel. I have amused myself in comparing certain items of cost at the Treadwell Mine in Alaska, as published by Mr. Kinzie, and those of the Portland Mine in Cripple Creek. At first glance one might say that in no two places could the conditions be more dissimilar. The Treadwell, with its immense bodies of uniform ore, mined very rapidly with comparatively small outlay for exploration and development, and the Portland, with its aggregate of more or less scattered small orebodies requiring for exploitation a large amount of development work, done to a considerable extent at random. Nevertheless, I find that there are certain operations at the Portland that find a parallel in the Treadwell, and in these cases it is worth noting how well the Cripple Creek property will compare. Mr. Kinzie gives the tonnage broken per machine shift in underground stopes of the Treadwell at 34.96. He does not state whether this is tonnage removed from the stopes or the actual tonnage broken, it being understood that in the underground part of the Treadwell mine about one-half of the ore broken is left in the stopes until they are worked through. In case the tonnage referred to is the actual breakage record of the machines, the performance is almost identical in cost with that in the wide stopes at the Portland mine. The table below gives the comparison.

At the Portland, small machines, 2¼ in., operated by one man at $4.00, are used. At the Treadwell, 3¾-in. machines, using 2.15 times as much air at the same piston speed as the Portland machines, and operated by two men at $7.87 per day.

	Portland.	Treadwell.
Tons per machine in all stopes	12.4	34.96
Tons in wide stopes	17.7*	†34.96
Tons per machine in drifts	5.3	9.6
Tons per foot in drifts	2.5	7
Labor cost per ton on ore broken in large stopes	*Cents.* 22.6	*Cents.* 22.5
Labor cost per ton broken in drifts	75	82
Labor cost per foot of drift for machine drilling	1.86	5.75

*One man machines. †Two men machines.

In the above cases the comparison is not unfavorable to the Cripple Creek property, the development work being much cheaper at Cripple Creek than at the Treadwell, but in this particular the cases are not parallel. Development work in the Treadwell means large openings designed for the extraction of heavy tonnage. At Cripple Creek the primary object of development work is to discover ore, and consequently the drifting and cross-cutting are designed to be driven with the greatest speed and the least expense, regardless of the future utility of the work for mining purposes.

The result of this difference in design of development work shows in the cost of tramming, which is over 20c. per ton at the Portland, as against a trifle over 3c. at the Treadwell. Twenty cents per ton is about the least that the tramming can be done for in Cripple Creek under the present plan in mining operations. It is not practicable to introduce haulage systems underground on account of the scattered small orebodies connected by crooked drifts. It is hard to see how any other arrangement than the present would apply. Therefore, the difference of cost of tramming between the Portland mine and the Treadwell is sufficiently accounted for by the radical difference of conditions.

Another expense at the Portland is timbering, which averaged for six months almost exactly 50c. per ton. At the Treadwell this expense is practically zero. This is a point in which the practice at the Portland mine might be open to criticism, because other mines in Cripple Creek succeed in extracting their ore with almost as small expense for timber as the Treadwell. Nevertheless, as I have attempted to point out in one or two former communications, the problem is not one of mere cost per ton, but that of mining the values at the best cost from a profit-making point of view, and in my judgment the timbering cost at the Portland is fully justified by the conditions.

Again, the cost of ore-sorting at the Portland is about three times as much as that of milling and concentrating at the Treadwell. Here again, the difference of cost is justified by a difference of conditions so obvious as scarcely to merit discussion.

The cost of hoisting at the Portland is about 22c. per ton, as against about 11c. for the Ready Bullion and Alaska Mexican, which handle about the same tonnage. This difference is one which should not exist, and is accounted for largely by the bad design of almost all Cripple Creek hoisting plants. There is no reason why Cripple Creek ores should not be hoisted by skips and dumped directly into ore-bins, as is done at the Treadwell, thereby doing away with the expense of top-tramming, which in Cripple Creek is invariably a large item.

I am giving the above comparisons largely because they are interesting in themselves, and partly to show that if the proper details were given, there is a legitimate comparison that can be made between mines even of great apparent difference in character. The publication of costs would be of advantage to many, probably most, mining companies, because by so doing they would bring to light certain deficiencies in their own management, which would, in course of time, be pointed out to them. Many companies are deluded into thinking that their superintendents are good mining men, simply because they have been on the property a long time.

Taken in the large, the discussion of mining costs will merge into that provoked by Mr. Hoover's article on mine equipment and ore reserves. Most competent mine managers will probably agree with Mr. Hoover that the problem is, to extract and market the entire deposit constituting a mine, at the greatest profit to the stockholder. They will fully agree with him on the economy, not only of providing abundant equipment for the rather speedy working of visible ore supplies, but also of working that equipment to its utmost capacity. The consideration of such subjects is the consideration of mining costs in the widest sense. The problem of deciding upon the best methods, the proper scale of operations and the *most desirable* cost to be aimed at, is one big enough for the best business intelligence a mining engineer can muster. Unfortunately, too many engineers confine their attention too much to technical subjects, and the owners of large enterprises often find it necessary to leave them out of consideration in the decision of the broader aspects of the business.

Ability to see things in their proper proportions and to lay strong hold of the essential features of an enterprise, is more vital to the success of a manager than all other qualities combined, and is more necessary at the beginning of an enterprise than at any other time. It is, indeed, rare that a good mine is absolutely spoiled, but nothing is more common than to see mines worked out under such handicaps of bad management that they fall enormously short of producing their just profits. This bad management is just as apt to be the result of some mistake in general principles, such as methods of mining, design and scope of plant, as from failure to work out everyday details. Mistakes due to failure to comprehend the structure and capabilities of the orebodies are extremely common, and I have seen mines brought to the verge of ruin by such mistakes.

It is only when the salient features of an enterprise have been worked out and decided on, that one is justified in figuring on the details of cost. For instance, one can scarcely estimate how much it will cost to hoist a ton of rock until he knows what kind of an engine he is going to have, as well as the appliances used in loading and dumping, etc. If his tonnage is small and uncertain, he will probably prefer not to put in skips with underground loading-

pockets, but will use light engines, small cages or buckets. Thereby he will save a portion of his plant investment, at the expense of a higher cost in daily manipulation. If you are able to hoist only 40 tons a day, you will still be compelled to employ two engineers at $4 a day, and your hoisting will cost 20c. a ton for engineers' labor alone. Circumstances may be such that a hoisting cost of 40c. a ton will be just as good practice at one place as 4c. a ton at another place. The thoroughly competent engineer will see the folly of working on unjustifiable economies. If a man really expects to hoist only 10,000 tons altogether, he will be a better engineer to get all that rock out with a windlass at $1 a ton, than to buy a $10,000 hoist in order to get it up for 10c. a ton.

The same kind of reasoning applies, in many ways, to a variety of items that make up mining costs. For example, a man may be doing excellent drifting, but he may do so much of it that it may appear as a large item in his cost of ore. Very likely he ought to receive praise for his good drifting, instead of blame for his high cost per ton.

It seems to me, therefore, that the costs that afford most interesting comparisons, and are most easy to obtain, are those which apply to such things as drifting, shaft-sinking, shoveling, machine drilling, etc., etc.: in fact, just such details as Mr. Kinzie gives in his paper on the Treadwell. When costs on these things are correctly stated, with information regarding the conditions of working, such as ventilation, water, kind of rock, manner and method of working, they become valuable. It would probably be amazing to see the difference between mines in the same district, working under identical conditions. These costs, therefore, and not the total costs, are those that might be given publicity without harm to the mining companies, and more often to their great advantage.

J. R. FINLAY.

Colorado Springs, Feb. 19, 1905.

MINE SIGNALS.

The Editor:

Sir—The engineer, whose duties carry him to widely separated mining districts, cannot urge too strongly the adoption of a uniform code of mine signals. Of course a complete code, which would fulfil the want in one case, might not be applicable to all others; but there are a number of important signals (such as 'hoist,' 'lower,' and those required in handling men and in blastin) which are not affected by local conditions, and it is to these that particular reference is made.

It is generally understood, in this country, that the signal '3 bells' means that men are to be hoisted. The writer has observed, in more than one instance, in the same district, that the following signals were employed for this purpose, namely: (A) mine. 3-1 bells Hoist men. (B) mine. 3 bells Hoist men.

It can be readily seen what a dangerous practice this is for any one going from mine A to mine B, especially if not accompanied by one familiar with the respective signals. So it is with other signals—for instance, that used in blasting, during shaft-sinking operations. In Mexico, carelessness in the use of mine signals is even greater than in this country; this is induced—one might almost say encouraged in some cases—by the crude and slack methods. In Johannesburg, Africa, a code of the important signals used in mining is embodied in the 'Mining Regulations,' and their use is rigidly enforced. It is generally acknowledged, by men of African experience, that the regulations, covering the work of mining as well as the use of boilers, are as comprehensive and complete as could be desired; that is, they meet the requirements of that country. The following quotations are taken from these regulations:

"In signaling, the following shaft-signals shall be used:

1 bell—Raise, when engine is at rest.

1 bell—Stop, when engine is in motion.

2 bells—Lower.

3 bells—Men about to ascend or descend.

3 bells—In reply, men may enter the cage or other conveyance.

5-2-1 bells—Blasting signal.

"In no case shall any person enter the cage or other conveyance, until the back-signal, '3 bells' has been given.

"The engine driver, when receiving the signal '1 bell' or '2 bells,' signifying to raise or lower any person, shall wait at least ten seconds, before starting to wind.

"The above code of signals, in the form of a distinctly legible notice painted on a board or enameled plate, 22 in. high and 20 in. wide, shall be posted up in the engine room, at the top and bottom of the shaft, and at the intermediate shaft-stations, for the time being in use.

"Special signals may be used at any mine, provided they are easily distinguishable by their sound or otherwise from the foregoing code, and do not interfere with it in any way."

In the code given above, the signal used in connection with hoisting men has been modified, and the return signal is no longer used. The blasting signal is applied as follows: When '5 bells' are rung, the engine driver lifts the conveyance a distance of 10 ft., in order to see that the engine, at the moment, is in working condition. When the next '2 bells' are given, the skip or bucket is lowered to the bottom to await the following '1 bell,' when the men are hoisted away from danger.

Some years ago the writer, when on the executive of the Rhodesia Chamber of Mines, was called to investigate the question of mine signals with a view to recommending to the Government a code to be embodied in the 'Mineral Ordinance.' The result of this inquiry would have been ludicrous, had it not disclosed such a dangerous state of affairs. It was decided that the best course was to request each mine manager to furnish a code of signals which he considered would cover his requirements. From these contributions was compiled a code as simple and complete as possible; those signals which required to be adjusted to meet local conditions being left to the discretion of the individual managers. In due course, each manager was furnished with a printed code, accompanied with a request that it be immediately adopted and posted in the most conspicuous places. One is impressed with the importance of adopting some such similar measures in this country. It might also be advisable to consider the compilation both of a mining ordinance, and also of boiler regulations, with a view to eliminating many risks attending gold mining as carried on at the present time. In Africa, Australia and other countries, mining inspectors are employed by the Government, whose duty it is to visit the mines periodically and to inspect the condition of underground workings as well as surface equipment. In our cities we have building inspectors; in such an important mining country as this, the Government should offer some assistance in the protection of those who are engaged in this latter industry.

F. C. ROBERTS.

Berkeley, Cal., Feb. 17, 1905.

ORE RESERVES.

The Editor:

Sir—Much of what has been written lately upon ore reserves, mine development and conservative investment versus stock gambling amounts to a proposal to develop the mine before beginning ore reduction. The usual prospect—even such as was the Cananea at first—has in the beginning installed a small plant to help pay for development. If the ore pinches out, the mine is abandoned or sold. If the stories told of the early days at Cananea are to be believed, that company began with very slim prospects, and without the money produced by the first plant, would have found it impossible to install the present equipment.

You say, "The value of the Cananea mines to an investor does not depend upon faith, but upon facts." If you mean the known facts, the remark is not correct. Upon the other hand, the unknown facts cannot influence the investor one way or the other. Investment in tailing piles or ore dumps can be founded on known facts, but when it comes to a mine like the Cananea, no one can pretend to any certain knowledge. That great London financial mining engineer believes that the mine and plant should end, as did the "one-horse shay," side by side; but how many plants are built to work only the

ore in sight, and to be worn out when that ore is gone? Reduction works are not built with reference to ore actually in sight, but rather with an eye to what is expected to be developed. The advised blocking of several years' supply of ore is on a par with building flat-bottomed ore bins, and seems to be for the same purpose. In the case of the bin, the ore, when required, must be shoveled, and to the mill or smelter man the necessity for frequent shoveling is always a mystery. He thinks that the ore could as well be kept in the mine and hoisted when required.

The subject of ore reserves has been handled in such a way by some recent writers that one could almost believe that the ore was created by development. We must remember that, even when not developed, the ore is there when required. As little development as possible—enough only to prevent delays in the reduction plant—is the rule in the majority of going mines. The amount of development required properly to estimate ore for stock speculation is a great deal more expensive than more practical mining development.

A recent technical editorial pertinently remarks: "The necessity of maintaining a reserve in excess of that necessary to insure continuous operation is often an additional expense, as well as a means of tying up a large amount of operating capital."

MARK R. LAMB.

San Francisco, Cal., Feb. 10, 1905.

THE METRIC SYSTEM.

The Editor:

Sir—Opportunity for discussion on the metric system has been open, and it has been utilized. A recent letter in the JOURNAL is specially commended for consideration, by reason of its optimistic sobriety. The metric system is good because it can be used everywhere. The burden of complaint of the conservatives hinges mainly on the difficulty and confusion incident to the change to the metric system. It is usually conceded that everybody would like it after the change. This plan is worth considering.

When in Germany, some years ago, I made careful inquiry on this very point, and with particular consideration of the feelings of the common public. I learned, with some surprise, but with much satisfaction, that when the change to the metric system was ordered by government, it was accepted at once and as a matter of course; in three or four days the populace were using the new weights and measures as though they had always used them. Popularly, in some cases old names instinctively attached themselves to the new units. Thus the half-kilogram became the 'pfund' (pound), which is a practical approximation; but on the whole new names also were used. The sun rose and set, and the world went on its course without interruption or confusion.

We can all remember the fancied disturbance anticipated for the actual resumption of specie payment, of the use of standard time, and other such innovations; but the disturbance failed to materialize. The technical and the curious can easily compare old conditions with new when it may be necessary. Then if our old system represents "a custom more honored in the breach than in the observance," why not proceed by unanimous action to the rational and economic basis of measurement? It needs only a united word of government to put it in force in the Post-Office, in the Custom House, in the bonded warehouse. In a week we would forget that we had ever been so foolish as to use anything but the easiest. For —other things being equal and right— the easiest way is the best; and that, in a word, is the Metric System.

DECIMAL.

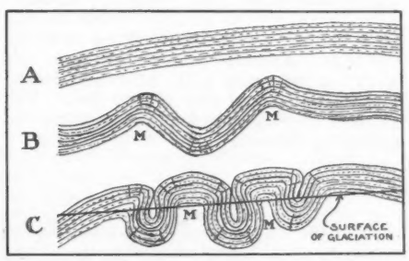
New York, Feb. 17, 1905.

GEOLOGY OF THE SUDBURY DISTRICT.

The Editor:

Sir—In the Report of the Geological Survey of Canada, 1904, page 6, under the marginal heading "Victoria Mines and Sudbury Maps," will be found the following:

"The principal new work on the Victoria Mines map has been the outlining



of the two smaller bands of norite south of the Canadian Pacific Railway. One of these, crossing the southwest corner of Drury, extends completely across the southern part of the township of Denison. This band, which comes to an end east of the Vermilion river, contains the Worthington, Mitchener and Totten mines."

Referring to the map mentioned, you will see that the norite band referred to is entirely distinct and separate from the large one to the north, containing the Victoria mine. The space between the two norite bands is occupied, as the map indicates, by sedimentary rocks standing on edge in accordion folds. This lack of connection between the two bands disposes of Dr. Coleman's funnel theory, and firmly establishes the fact that the norite bands are the cores of pressure folds exposed by glaciation and erosion.

The enclosed sketch will illustrate how sedimentary rocks, deposited upon the crust of the highly heated and contracting magma of the earth, will be folded until the stratification planes are vertical. This is caused by the contraction of the inner mass throughout its extent and local adjustment of the cold crust to make it fit the interior. *A, B* and *C* are sections at different stages of folding, and represent long periods of time judged from our human point of view, but short in a geological sense. *M,* representing the magma, will be forced upward with the folds and finally exposed by glaciation of the sedimentary. The sedimentary rocks will be standing on edge and separating bands of eruptive. In a topographical sense and on a large scale these folds are mountain ranges, and mark the buckling of the earth's crust to adjust itself to the contracting interior.

The application to this district is found in the existence of a range of pressure folds surrounding a basin of sediments in the region extending 25 miles northeast from Vermilion lake. Between the exposed edges of the sedimentary rocks we find the norite cores, which are more basic as we recede from the sediments toward the center, because that is the point which has been least affected by surface waters before and during the time the sediments were being deposited. Silica being the least soluble of the rock elements, it is perfectly reasonable that such should be the case.

So much for the geological facts of the case. Now let us return to the magma differentiation theory. Pyrrhotite has a specific gravity of from 4.8 to 5.2, according to the varying contents of copper and nickel, while the norite has a specific gravity of about 3.1. Admitting, for the sake of illustrating a point, that the pyrrhotite would not have burned with explosive energy in the nebular period and could have existed in the molten norite for all that time, I would ask why did it not separate out and gravitate toward the center of the earth? The laws of gravitation are just as active below the surface as above. The finest sediment can settle to the bottom of the deepest ocean. Pressure does not alter the relation of their specific gravities.

The only hope for that ancient and feeble theory is to assume that the norite came out on the surface and melted in the sunshine.

HIRAM W. HIXON.

Victoria Mines, Ont., Feb. 16, 1905.

The sulphur in a particular matte is largely determined by the amount in the charge, the amount of silica or lime added to the charge, and the use of hot blast. The sulphur vaporized as sulphur di-oxide varies with the furnace and the ore, and is usually from 70 to 85 per cent of the whole. The old method of sulphur-control depended on preliminary roasting.

Mining Stocks.

(Full quotations on pages 390 and 392.)

New York. Feb. 21.

Another holiday—the second in this, a short month—has rather taxed the patience of speculators who, unless public buying on a large scale begins soon, will be compelled to curtail expenses. Amalgamated Copper shows small trading at $73.75@$77.875. Anaconda moves quietly around $27. Greene Consolidated Copper has gained 700 stockholders (now numbering 3,900) since last December; the stock sold this week at $28.125@$27.75. Tennessee made a few sales around $31, and British Columbia at $6.125.

Twenty shares of Homestake, of South Dakota, sold at $74 per share. Standard Consolidated, of California, reappeared at $1.75, and Ophir of Nevada, stood at $7. Horn Silver, of Utah, is higher, at $1.75.

Federal Mining & Smelting shares are prominent traders, the 6% common, as a result of an extra 1% quarterly dividend, selling at $99@$114, and the 7% preferred at $92.50@$97.

American Smelting common stock shows good trading at $85.75@$90.25, and the preferred at $117.25@$119.

Standard Oil has declared a 15% quarterly dividend, which compares with 7% in December, and 16% in the first quarter of 1904. For the year 1904 dividends amounted to 30%, as against 44% in 1903. Upon declaration of the present quarterly dividend the stock was quoted at $642, which is somewhat less than the previous sale.

The Virginia-Carolina Chemical Co. has made application to the New York Stock Exchange to list $6,500,000 10-year collateral trust 5% sinking fund coupon bonds of 1912. The company has outstanding $18,000,000 in 8% preferred stock, selling at about $110, and $27,984,400 common stock, paying no dividends at present, though it is quoted at $30 per share.

It is reported that the extensive interests controlled by the Guggenheim Exploration Co., in Missouri, Colorado and Mexico will be turned over to the American Smelting & Refining Co. The plan proposed is said to be the formation of a new corporation, with a capital of $49,000,000, half of which is to be 6% cumulative preferred and half common stock. The preferred shares are to be divided into two classes—series A and B. Of A, $17,000,000 will be issued, and B, $7,500,000. It is proposed to increase the A stock by $5,500,000 at some future date, making the entire issue of preferred shares $30,000,000. Such a transfer will make practically no difference in the general policy or actual control of the company.

Boston. Feb. 20.

In keeping with New York the local market shows a marked improvement, and particularly in copper shares. The increase in the Wolverine dividend to $5, caused that stock to sell at its highest record, $120 per share. It closed at $118 to-night, net advance of $5. It is now expected that the Calumet & Hecla will make its next payment $15, against $10 paid in December. The stock is up $12 to $690. In connection with these facts, a great many mining companies will hold their annual meetings next month, and the reports which will then issue, will make interesting reading, in view of the high price received for copper during 1904. The arguments are all bullish and the only thing needed to make a boiling market in copper shares is buying, and some one big enough to create a following.

Copper Range is up $2 for the week to $71.25. It is felt that dividends by this company will be begun in April at the rate of $4 per annum. President Paine is now at the Lake region to survey the property. It is likely that, upon his return, the first $1 dividend will be declared.

Allouez has advanced $1.75 to $22, on advices that the Kearsarge lode has been intercepted in sinking the shaft, although at this writing nothing definite is known about it. Excellent buying has caused Mass to move up $1.12½ to $13, and Michigan $2 to $15. Centennial is up a fraction to $20.25 on reports that rich ground has been encountered at one of the lower levels. On concentrated buying Winona has advanced $1.62½ to $13.12½. An assessment is payable on Winona stock this week. Fair buying of Mohawk has advanced the price $2.37½ to $54.87½. Old Dominion is slightly firmer at $27.75 and Utah is up $1.25 to $42.50. United States has advanced $1.12½ to $25.12½. This company has started its second lead furnace, although it is not shipping the product at present. It has lately acquired an iron property for fluxing purposes.

Trinity has been quiet around $11 and Victoria is up almost $1 to $5.75. Osceola rose $1 to $93, but lost most of it. Isle Royale is fractionally higher at $26, and Greene has risen $1.12½ to $28. Daly-West rose $2.50 to $18.50, losing a fraction. Advices from the property are encouraging. Quincy has been heavy, falling $4 to $106, with subsequent recovery. Tamarack closes $2 higher at $134. Shannon is better at $7.25. Granby hovers just above $5. This company has made recent adjacent additions to its territory. Ashbed, which has been dead, recently touched 50c. a share on the levying of a $1 assessment, calling for $40,000. Work is to be resumed. Ahmeek sold at $47 late last week on the curb. St. Mary's Mineral Land was quoted $65 bid to-day. The advance of Amalgamated to $76 is an encouraging feature.

Colorado Springs. Feb. 17.

El Paso has been the feature of the week, scoring a gain of about 15c., closing to-day at $1.85 bid, passing Portland by 2c. Findley has been dropped from the list and Findley Consolidated listed, and this stock advanced from 76 to 82c. during the week. Elkton is selling around 68½; Isabella for 34½; Portland, $1.83; Work, $16; Gold Coin, 35; United Gold Mines, 30; Acacia, 11⅝; Gold Sovereign, 12½c. C., K. & N. is quoted 22 asked; Vindicator, 80c@90c; Golden Cycle 50c@60 per share.

Ishpeming. Feb. 18.

It is always easier to dispose of offerings at the market price than it is to buy, says the Wallace H. Hopkins Co. New York, Pittsburg and Boston have been heavy buyers of Lake Superior & Pittsburg, Calumet & Arizona (which has declared a quarterly dividend of $2) and Calumet & Pittsburg. Pittsburg & Duluth has been in good demand, despite the assessment due. Cause for a flurry in the stock market in the fore part of the week was the report of the proposed consolidation of the Bonanza Circle companies. Mention of this plan was made in the editorial columns of the JOURNAL for February 16.

Salt Lake City. Feb. 17.

The features of this week's trading on the floor of the Salt Lake Stock & Mining Exchange, were furnished by New York Bonanza, of Park City, and Uncle Sam Consolidated, of Tintic. Inside interests have been buying in the case of the former, while the latter was strengthened by the development of what appears to be an extensive body of low-grade milling ore, in what is designated as an extension of the May Day vein; May Day, influenced by Uncle Sam, was also active; there is a remote possibility of the two mines being consolidated, as the latter has no facilities for milling while the other has this equipment. Ajax has been active and stronger. Daly-West is on the up grade, and there seems no doubt but that the present management will receive endorsement at the meeting of the stockholders next week. Daly-Judge was not wanted, while there was some demand for Silver Shield at about last week's closing prices. A few small blocks of Utah Copper stock were curbed at $10 a share. Wabash has been weak, but the market for it closed stronger. Yankee Consolidated remained unchanged. The present month will pass with a light dividend record; the Silver King will pay its usual $100,000.

San Francisco. Feb. 16.

The sworn statements of the mining companies, as filed in their offices this week, showed cash on hand, Feb. 1, as below, with all expenses paid, unless otherwise noted: Alpha, $3,714; Alta, $1,437, with bills payable of $3,734; Andes, $7,163; Belcher, $1,679; Best & Belcher, $2,288; Bullion, $322; Caledonia, $225, with January expenses unpaid; Consolidated New York, $2,978; Chollar, $4,865; Consolidated California and Virginia, $20,024; Crown Point, $4,652; Consolidated Imperial, $2,649; Challenge Consolidated, $3,235; Confidence, $4,487, with January expenses unpaid; Exchequer, $784; Gould & Curry, $209, with bills receivable of $390;; Hale & Norcross, $137, with indebtedness of $2,000; Julia Consolidated, $1,355; Justice, $63, with bills payable of $400; Mexican, $8,785; Ophir, $51,022; Overman, $9,387, with January expenses unpaid; Potosi, $732; Savage, $4,014; Segregated Belcher, $3,239; Silver Hill, $10,607; Scorpion, $966; Syndicate, $2,703; Standard Consolidated, $30,388, with January clean-up and January expenses to be accounted for; Union Consolidated, $201, with indebtedness of $2,000; Utah Consolidated, $4,294.

The Sierra Nevada reports no cash on hand, and an indebtedness of $2,043 at the opening of the month.

Coal Trade Review.

NEW YORK, Feb. 21.

ANTHRACITE.

The only new features in the hard coal trade are those reflected from the state of the weather. The seat of the difficulty, however, has been shifted from the harbor points to the producing ends of the railroads, all roads having suffered severely in shipments from their mines. The Lehigh Valley was forced to close down last Thursday, and at last accounts has not yet been re-opened. Movements at New York harbor continue as difficult as ever, although the mild weather just beginning gives reason to hope for an early improvement. Shipments to Boston all take the outside course round Sandy Hook, as the

Sound is nearly impassable. Traffic in the city streets shows no improvement.

Prices remain at the same level, domestic sizes selling at $4.75 for broken, and $5 for egg; steam sizes range $3 for pea, $2.25@$2.50 for buckwheat, $1.45@$1.50 for rice, and $1.30@$1.35 for barley; prices quoted are those asked at harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft coal trade is controlled altogether by the weather. Transportation on water is in a much worse state than it is on land, particularly at points where the ice is jammed by the tides. The entrance to the Sound at Whitestone presents the greatest difficulties, and boats have not uncommonly been held there for several days at a time. Prices have advanced during the week, the quotations, f. o. b. harbor shipping points being $3 for ordinary, and $3.15 and upward for better grades. At this writing, the condition of the ice is improving with the warmer weather.

A dinner of the coal operators was held in Philadelphia yesterday, which, on previous occasions, has had some influence on the market, but we have not yet heard the outcome of this gathering.

Trade in the far East shows fair demand, but the delivery of orders is greatly delayed in the hands of shippers, as the captains of even large vessels prefer to stay in harbors, rather than to risk meeting the ice. The East, however, was well prepared to withhold the giving of orders, and has not felt the curtailment of its receipts during this present siege, as might have been expected.

The Sound ports are taking a good amount of coal, but under great difficulties, owing to the congestion at the receiving points. Tows report that they have encountered ice, all the way from Whitestone, and Throgg's Neck to New London.

Trade in New York harbor is calling for large amounts of coal, but the great difficulty is met in drawing it from the shipping points. Tows through the Kills were delayed three or four days during last week, and as a last resort, tows from the most southerly New York harbor points took the outside passage around Staten Island, notwithstanding the underwriters' restrictions, which are provided for such contingencies.

All-rail trade shows a strong demand and high prices. Transportation from mines to tide has been fairly good, the slight irregularities being readily accounted for under present conditions. Car supply continues to be short, not more than one-quarter of the requirements being met, and in some cases not more than one-eighth.

Owners and brokers of coastwise vessels do not care to make terms, preferring to keep their vessels in the harbors, and avoiding all possible business. Baltimore and Philadelphia are closed by ice in Chesapeake bay and the Delaware. A fair quotation for large craft would be 85@95c. from Norfolk or Newport News to around the Capes. Rates from New York harbor to the same points would be about 80c., but very few vessels are offered at any price.

Birmingham. Feb. 20.

Severe weather has interfered with the production of coal in Alabama during the past two weeks, and the output has not been satisfactory. There is quite a little coal famine on in Birmingham itself. Wholesale dealers are unable to make delivery, while the retail dealers are putting off their customers with promise to deliver "the next day." The larger consumers who were wise and laid in a good stock are beginning to show some fears, as their stock begins to dwindle. The coke production has fallen off considerably in the last fortnight, not because of the output of coal, but the weather has practically forbidden out-door work. Coal at retail is selling at $3.50@$4.50 per ton in the city, while the larger consumers who have contracts, are unable to get deliveries. Even the railroads are experiencing some trouble in getting their supplies.

The Sumter mines, in the Blue Creek region, Jefferson county, property of the Tennessee Coal, Iron & Railroad Co., have been on fire since Feb. 12th last. An insinuation that the fire was started by union miners brought a vigorous denial from their leaders, and they set on an investigation, reporting that the fire was started by miners who built a fire in the mines to warm their lunches. The mines are being flooded with water in the hope of extinguishing the flames. It will be several weeks before the mines can be operated again, even if the flames are subdued in the next few days.

Chicago. Feb. 20.

Exceedingly cold weather has at last brought activity of sales to dealers in both anthracite and bituminous coal, but this has been largely offset by the tribulations the trade has endured in the last week through transportation difficulties. The railroads in every direction have been blocked with snow and ice, so as to make it impossible to handle coal shipments promptly. As regards the trade in bituminous, this has been a good thing; prices have risen and the over shipment that has prevailed for the last year—especially from western mines—has been checked.

Domestic bituminous is higher and active; steam coals are in better demand than at any time of the winter previously; there is no real weakness anywhere in the trade. Illinois and Indiana domestic lump brings $2.30@$2.60; in steam sizes lump is about $2 and run-of-mine $1.60@$2. Screenings are up again to the $1.50 mark. Hocking has been very scarce and has sold for $3@$3.10. Youghiogheny has not been in heavy demand, but the supply has been light, and the coal has brought $2.90@$3.10. Smokeless is perhaps most affected by the railroad troubles; the small supply that has come forward has been eagerly taken at $3@$3.15.

Cleveland. Feb. 20.

On account of the weather conditions, some difficulty has been experienced by foundry owners in getting coke delivered as they need it. The railroads are finding their supply of cars not altogether equal to the emergencies. The ovens, however, are producing abundantly for all needs, and prices are easy from that cause, rather than from the supply in the market. Prices have not changed, good 72-hour foundry coke being sold at $2.75 to $3 at the oven, and furnace coke selling at $2.40 to $2.60 at the oven. There is a plethoric condition of steam coal in the Cleveland market. The long continued abundance of that coal in this market and the continued heavy shipment to this point argue a similar condition elsewhere in this territory. Prices have eased a little under the pressure of some owners to sell the coal and the market is rather weak. Quotations hold at 95c.@$1 at the mine for run-of-mine grade. There is a good steady demand for domestic coal, but the stress of competition and the abundance of coal in this market is keeping the price down. Prices hold at the mid-summer level of $2.30 for selected lump at the mine in the Massillon district, with Coshocton and other coals about 50c. a ton lower.

Pittsburg. Feb. 20.

Coal.—The severe weather has caused an increased demand for coal, the natural gas supply being inadequate. As a result prices in the local market are higher. The supply of railroad cars is better and mills that run short of gas were able to obtain all the coal needed. The ice in some of the pools was broken last week, and operations were resumed at several of the river mines. It is expected that the rivers will soon be navigable and a heavy shipment to the lower markets is to be made. An important deal of the week was the sale of the Hazel Kirk Coal Co.'s two mines in this district to H. A. Kuhn and associates, who now own several independent concerns with an annual capacity of 1,500,000 tons, which will now be increased to over 2,000,000 tons. The price paid for the Hazel Kirk property is given at $1,000,000, which establishes a price of nearly $1,000 an acre for coal land in that region, which is in Washington county, and is reached by a branch from the Monongahela division of the Pennsylvania Railroad. Adjacent to the Hazel Kirk property are valuable coal lands owned by the Jones & Laughlin Steel Co., the Monongahela River Consolidated Coal & Coke Co., the Ellsworth Coal Co. and the Pittsburg-Buffalo Co. The latter company owns about 20,000 acres. There is no change in prices of coal, which is quoted this week at $1.10 for run-of-mine.

Connellsville Coke.—Production and shipments fell off somewhat, owing to the unfavorable weather, but the demand is good and prices are firm. Furnace coke is quoted this week at $2.50@$2.75, and foundry coke at $2.75@$3. The production for the week amounted to 258,000 tons, being 1,056 tons less than that of the previous week. The shipments aggregated 10,902 cars distributed as follows: To Pittsburg and river points, 4,193 cars; to points west of Pittsburg, 5,495 cars; to points east of Everson, 1,214 cars. This was a decrease of 45 cars compared with the previous week.

Foreign Coal Trade. Feb. 22.

Exports of fuel from Great Britain in the month of January are reported as below, in long tons:

	1904.	1905.	Changes.
Coal	3,568,892	3,262,364	D. 306,528
Coke	62,096	54,740	D. 7,356
Briquettes	52,476	108,729	I. 56,253
Total	3,683,464	3,425,833	D. 257,631

In addition to these exports, there was sent abroad, for the use of steamships engaged in foreign trade, 1,345,638 tons of coal in 1904, and 1,321,789 tons in 1905, a decrease of 23,849 tons.

The exports to the United States, included in the total above, were as follows, in detail:

	1904.	1905.	Changes.
Atlantic ports	8,908	7,126	D. 1,782
Pacific ports	5,523	6,457	I. 934
Total	14,431	13,583	D. 848

In January, 1903, the exports to Atlantic ports were 567,421 tons, marking almost the close of the extraordinary movement resulting from the anthracite strike.

Iron Trade Review.

NEW YORK, Feb. 22.

The iron trades are recovering a little from the comparative quiet, which settled down two or three weeks ago. Buying is better, and consumers are again beginning to take an interest in matters, indicating that they are using their supplies, and still expect a good business. Prices are getting back again towards the level of a year and a half ago.

At the meetings held in New York last week, the Beam Association voted to advance the price of structural shapes $2 a ton to take effect immediately. The Plate Association advanced the base price of ordinary widths of steel plates from 1.50 to 1.60c. Pittsburg, also $2 a ton. The Bar Iron Association met in Pittsburg last week also, and decided to make no present change in prices, but to continue the minimum quotation at 1.50c. Pittsburg. The Steel Bar Association meets in Pittsburg this week, and it is believed will order some advance.

Rumors are revived of the consolidation of Southern iron interests, which was seriously talked about a year ago, but nothing definite can be ascertained.

Ore buying is pretty well over for the season, and the prospects are for a very large movement down the Lakes this year.

German Iron Trade.—Exports of iron from Germany for the full year are reported as follows, in metric tons:

	1903.	1904.	Changes.
Pig iron	418,072	225,897	D. 192,175
Other iron and steel	3,063,152	2,544,379	D. 518,773

There was a decrease last year, which was partly due to a cessation of the demand from the United States for pig iron and steel billets, which was considerable in 1903.

Imports for the year were as follows, in metric tons:

	1903.	1904.	Changes.
Pig iron	158,347	178,256	I. 19,909
Other iron and stel	157,557	166,712	I. 9,155

This shows small increases, but the changes were not important.

The movement of iron ores for the year was as follows, in metric tons:

	1903.	1904.	Changes.
Imports	5,225,336	6,061,127	I. 835,791
Exports	3,343,510	3,440,846	I. 97,336
Excess, imports.	1,881,826	2,620,281	I. 738,455

The more important imports were from Spain and Sweden. The exports were chiefly of ores from Luxemburg to France and Belgium.

Imports of manganese ores were 223,709 metric tons in 1903, and 255,760 tons in 1904; an increase of 32,051 tons. Exports were unimportant, being only 11,138 tons in 1903, and 5,536 tons last year.

Imports of slag formed a large item, being 877,394 tons in 1903, and 846,738 tons in 1904; a decrease of 30,656 tons. These imports are chiefly from France and Belgium, and are basic slag, used in making fertilizer, on account of its phosphoric acid content.

British Iron and Steel Trade.—The exports of iron and steel, including machinery, from Great Britain in the month of January are valued by the Board of Trade returns as below:

	1904.	1905.	Changes.
Iron and steel	£2,317,842	£2,304,963	D. £12,879
Machinery	1,441,770	1,597,112	I. 155,342
New ships	214,266	127,576	D. 86,690
Totals	£3,973,878	£4,029,651	I. £55,773

Exports of mining machinery were valued at £47,117, of which £17,636 in value went to South Africa. The chief items of the iron and steel exports were, in long tons:

	1904.	1905.	Changes.
Pig iron	59,076	43,844	D. 15,232
Wrought iron	16,563	13,778	D. 2,785
Rails	52,009	42,261	D. 79,48
Plates	11,238	10,861	D. 377
Sheets	30,516	35,076	I. 4,560
Tin-plates	27,973	29,923	I. 1,953

The only items showing increases were sheets and tin-plates.

Imports of iron and steel for January were valued £622,523 in 1904, and £646,697 in 1905; an increase of £24,174. Some leading items of imports were, in long tons:

	1904.	1905.	Changes.
Pig iron	10,066	10,807	I. 741
Wrought iron	16,661	6,171	D. 10,490
Steel blooms, billets, etc	30,711	46,851	I. 16,140
Structural steel	19,417	12,222	D. 7,195

Imports of iron ore were 612,003 tons in 1904, and 483,992 tons in 1905; a decrease of 128,011 tons. Of this ore, 503,133 tons in 1904, and 377,191 tons in 1905 came from Spain.

Birmingham. Feb. 20.

The general conversation in iron and steel circles in the Birmingham district is in regard to the probable consolidation of various interests in this section. High officials of the Alabama Consolidated Coal & Iron Co., the Sloss-Sheffield Steel & Iron Co. and the Republic Iron & Steel Co. left here for New York during the past week, and the object of the trip was to discuss and accomplish, if possible, a consolidation. A combination of the companies mentioned would bring about a company with fourteen blast iron furnaces, numerous coal and ore mines, coke ovens, limestone quarries and other properties. Rumors also prevail that the Tennessee Coal, Iron & Railroad Co. may be included in the consolidation.

The following quotations are given: No. 1 foundry, $14@$14.25; No. 2 foundry, $13.50@$14; No. 3 foundry, $13@$13.50; No. 4 foundry, $12.50@$13; gray forge, $12.25@$12.50; No. 1 soft, $14@$14.25; No. 2 soft, $13.50@14.

No. 2 foundry iron is not selling under $13.50 per ton, as far as can be learned and on Saturday, of the past week, it was announced that there was no great quantity of iron to be obtained at that price.

Chicago. Feb. 20.

Light buying has characterized the local market for pig iron in the last week, except for one large purchase (said to be 40,000 tons at $13.50, Birmingham), of Southern by a firm of selling agents. Despite the conditions that would seem calculated to lower prices, there is no change from last week's standard quotations—$13.50 Birmingham, or $17.15 Chicago, for Southern and $17.50 for Northern—on No. 2 iron. Users of iron in this territory are buying chiefly for the needs of the near future and in small lots; the largest sales of the week, outside the 40,000-tons transaction, being not more than 1,000 tons each. For the week, the aggregate of sales to consumers probably has not exceeded 20,000 tons.

The chief reason for the suspension of buying by users of iron seems to be a general feeling on the part of foundrymen that prices will not be sustained. Perhaps

Coke has been in somewhat less demand in the last week, though receipts have been greatly curtailed by snow and ice affecting the railroads. That the supply has been sufficient is shown by the fact that there has been no lowering of the price, $5.65 for 72-hour Connellsville. Virginia and West Virginia cokes bring $5@$5.50.

Cleveland. Feb. 20.

Iron Ore.—There is little buying of iron ore for shipment during the coming season, but a good part of the contracting has been done and the market may be expected to be quiet for the time being. Prices hold steady on the basis at which earlier sales were made, namely, $3.75 for bessemer Old Range; $3.50 for bessemer Mesabi; $3.25 for non-bessemer Old Range, and $3 for non-bessemer Mesabi.

Pig Iron.—The market has been rather steady, with some evidence of quickening in the foundry trade. There is a little better buying for second-quarter delivery and some increase in inquiry for second half. The small buying of the present time serves to bring out a feature heretofore neglected. The furnaces have not been selling heavily at any one time for second-quarter delivery, but sales have been steady and this has resulted in taking up almost all of the material available for contracts for second quarter. The prices prevailing here of late have been universally $16 in the Valleys for No. 2, which is still being asked and paid. The inquiry is a little heavier for second half, but not much business has been done as yet. Southern furnaces are out of this territory almost altogether. The price has ruled at $13.50 Birmingham, for No. 2 foundry, and the market is rather slow here, although the furnaces are not dependent on this territory for their business as much as this territory normally depends upon the southern stacks for a good part of its iron. There is some little buying of bessemer at $16 in the Valleys, and there has been a little basic sold on the same basis.

New York. Feb. 22.

Pig Iron.—The market is easier, and local demand only moderate. Foundries do not seem to be working off their stocks as fast as expected. At the same time, furnaces are not pressing sales. There are rumors of concessions on second-quarter deliveries, but they cannot be verified. Little business is done here in bessemer pig, the local trade being made up of foundry iron chiefly, with some basic pig. There is no actual change in prices, and we quote as follows: No. 1X foundry, $17.75; No. 2X, $17.50; No. 2 plain, $16.75; gray forge, $16.50. Southern iron is a little shaky, but no material change in price can be given. We continue to quote for large lots on dock: No. 1 foundry, $17.75; No. 2, $17.25@$17.50; No. 3, $16.75; No. 4, $16.25; No. 1 soft, $17.75; No. 2 soft, $17.25; gray forge, $16.25. Business in pig iron warrants has been very dull. March deliveries are $16 bid, $16.50 asked.

Bars.—Bar iron is 1.745c.@1.845c. for large lots at tidewater. Steel bars are quoted at 1.645@1.745c. Store trade is steady. An advance in steel bars is ex-

Plates.—Plates are in good demand. A general advance has been made. Tank plates are 1.745@1.845c., New York delivery; boiler plates, 1.845@1.945. Extra charges are made for extra widths.

Structural Material.—A general increase in prices has been made by the pool. Beams and channels up to 15 in. are now 1.745c. for large lots; over 15 in., 1.845c. Angles are 1.745c. for large orders. The advance is $2 per ton.

Steel Rails.—The regular quotation continues $28 per ton at mill for standard sections. Very little business is done in this market. Light rails continue in good demand, prices varying from $23 for 35-lb. sections, up to $28 for 12-lb. rails.

Philadelphia. Feb. 21.

Pig Iron.—There is less anxiety to buy pig iron this week than last. It is intimated in high circles that quotations are likely to weaken. This rumor was chased up to-day, but no pig iron people seem to know anything about it. Outwardly, quotations are the same. For certain kinds of iron there is a demand for forward delivery, such as basic and malleable. Some big sales have been made, and brokers familiar with the situation say that buyers of basic are by no means done. Very little has been done in forge and foundry this week, but the bad and cold weather explains a good deal. A good many of our users of foundry iron, as well as basic, have considerable material on hand; others feel they are pretty well protected by contract, and for that reason there is not the same amount of business offered from the smaller buyers. Some large consumers, asked on this point, said that the activity of the past few weeks in buying is in excess of actual melting requirements, and that there will be less buying done in March than there was in January. No. 1X foundry has been quoted as high as $18.25; No. 2X foundry is selling at $18.50@$17.75; No. 2 plain is worth $17 easy, and standard forge is picked up at $16.25. Basic is said to be strong, at $16.50.

Pittsburg. Feb. 20.

The features of the iron and steel markets for the week were heavy sales of pig iron and advances in prices of plates and structural material. An announcement of a further increase in prices of wire and wire products was expected today, and likely will be made before the end of the week. It is confidently believed that black sheets and tin-plate will be advanced before the first of next month, and an advance in steel bars is expected to be ordered at any time. These advances, in most instances, are merely the restoration of reductions made during the dull periods last year. The latest advances made were by the Plate Pool and the Beam Association at meetings held in New York on Thursday, and bring plates and structural material to the prices which ruled from 1901 until last September, when there was a cut of $4 a ton in these lines. At meetings held late in December prices were advanced $2, and on Thursday another uniform advance of $2 was ordered. It was believed here that the United States Steel Corporation would oppose a change in prices, and that its opposition would be strong enough to prevent an advance. The result of the meetings, therefore, caused some surprise. It was reported that while the Corporation did not favor the action, it did not make any vigorous fight against the restoration of the old prices. Plates are now quoted as follows on tank quality, ¼-in. and heavier: 6¼ to 14 in. wide, inclusive, 1.50c.; over 14 and not over 100 in. wide, 1.60c. Structural material quotations follow: Beams and channels, 15 in. and under, angles, 2 by 3 to 6 by 6, inclusive, and zees, 1.60c.; tees, 1.65c.; beams and channels, over 15 in., 1.70c. The market for finished steel products is in a very satisfactory condition, and considerable new business was placed during the week, although the tonnage in most instances was not very large. All the mills in the Pittsburg district continue busy, specifications on old contracts being very heavy. Some mills are from two to three weeks behind in deliveries. An active buying movement is confidently expected shortly, and the year promises to be the most prosperous in the history of the steel industry. Building operations in this district have been retarded by the action of the Builders' Exchange League. It demanded an open-shop clause in the annual wage agreements made with the different building trades. Refusal to concede this point resulted in a lockout, and new building projects are held up. There was a break on Saturday, when two of the trades offered a compromise, which was accepted by the league, and indications point to a satisfactory settlement of all wage scales before the end of the week. Some of the trades have proposed two-year agreements which, if generally agreed to, will remove all uncertainty regarding labor troubles and contracts are expected to be let for some large projects.

The sales of pig iron, principally southern foundry, within the past week or ten days is estimated at about 100,000 tons. Some large deals were made through Pittsburg brokers, and inquiries this week are very heavy. The sales of southern iron were on a basis of $13.50, Birmingham, for No. 2 bessemer iron from Valley and Pittsburg furnaces is being shipped contracts of importance have been made as rapidly as produced, and while no new this week, the market is very strong. The United States Steel Corporation is still negotiating with the Bessemer Pig Iron Association and independent producers for bessemer iron for March delivery. It is expected to take at least 25,000 tons, and may get the iron at $15.50, Valley, although furnace interests are quoting bessemer iron at $16 at the furnace. The Corporation last week bought 5,000 tons of bessemer iron from the association, at $15.50 for February delivery. The iron is for the Lorain works of the National Tube Co., a subsidiary company. More iron may be required for this interest for March, and the Carnegie Steel Co. also will require more iron than can be produced by its blast furnaces.

Pig Iron.—The market is in excellent condition, and prices are much firmer this week. It is estimated to-day that from 20,000 to 25,000 tons of all grades of pig iron have been sold by Valley and Pittsburg furnaces within the past week, but all sales, including southern iron, will aggregate about 100,000 tons. Quotations to-day are as follows: Bessemer, $15.50 @$16, Valley furnace; foundry No. 2, $16.85@$17.10, Pittsburg; gray forge, $16.10@$16.25, Pittsburg.

Steel.—The demand for bessemer and open-hearth billets is increasing, and in many instances premiums of $3 are being paid above the pool price of $21. Producers are not willing to sell far ahead, even at the premiums offered, and some are behind in deliveries. Sheet and tin-plate bars also command a premium. The advance just ordered puts plates at 1.60c., and merchant steel bars remain at 1.40c., although an advance may be made at any time.

Sheets.—The market is very strong, and premiums are reported to have been paid in some instances for prompt delivery. Some large orders have been placed lately, evidently in anticipation of the advance that is expected to be ordered by the leading producer. All the mills of the big company are in full operation, and most of the independent mills are busy. Black sheets, No. 28 gauge, are quoted at 2.30c., and galvanized sheets at 3.45c.

Ferro-Manganese.—There is but little change in the market, and 80% domestic continues to be quoted at $46, although it is possible to shade this price by about $1 on a large order.

Chemicals and Minerals.

NEW YORK, Feb. 22.

The market continues to be uninterestingly quiet. Users of the potassium salts, imported from Germany will pay more this year than last, the exception being kainit, which has been reduced to check competition with independent producers. The new schedule will be effective up to March 1, after which date there will be an extra charge of 3c. per 100 lb. for concentrated salts, 25c. per ton for kainit, and 40c. per ton for manure salt, minimum 20% actual potash. For concentrated salts, new prices for bags, in lots of not less than 50 long tons, basis of foreign invoice weights, tares and analyses, are as follows, f. o. b. North Atlantic ports:

	Testing.	Basis.	Per 100 lb.
Muriate of potash.	80@85%	80%	$1.87
Muriate (minimum).	95%	80%	1.90
Sulphate (minimum)	90%	90%	2.155
Sulphate (minimum)	96%	90%	2.185
Double manure salt	48@53%	48%	1.135

To Southern ports, an advance of 3c. per 100 lb. must be paid on prices given above.

For kainit testing 12.4% actual potash, equivalent to 23% sulphate of potash, quotations at North Atlantic or Southern ports are $8.25 per long ton, per invoice weights, or $8.50, per actual weights, ex-vessel at port of importation. Manure salt, minimum 20% actual potash, is quoted at North Atlantic ports at $14.35 per long ton, invoice weights, and $14.80, per actual weights, ex-vessel at port of importation, while to Southern ports 65c. per ton more is asked. It is anticipated that this will not be as good a year as last, in consequence of the expected curtailment of cotton planting in the South.

Acids.—Strong, and in sulphuric acid larger shipments are noted.

Nitric acid, 36°, 100 lb.	$5.00
38°, 100 lb.	5.25
40°, 100 lb.	5.50
42°, 100 lb.	5.75
Oxalic acid, com'l, 100 lb.	5.00@ 5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66°, bulk, ton	21.00@23.00

Sulphur and Pyrite.—In the pyrite trade a few large orders have been booked for future shipment at a little less than quotations on prompt deliveries. Sulphur is quiet. Another large cargo of domestic sulphur will arrive in a few weeks, to be delivered among consumers in the North. Domestic seconds at New York are quoted at $21.45 per ton, and prime, $21.75. For delivery at Baltimore and Philadelphia prices are 25c. per ton higher, and to Portland, Maine, 15c. Foreign brimstone is quiet, at nominally $21.25 per ton for best unmixed seconds for shipment, and 50@75c. less for thirds. Domestic pyrite, 42@44% sulphur, is quoted, f. o. b. shipping port, at 10@10.5c. per unit for lump, and 8.5@10c. for fines. Foreign pyrite, 44@52% sulphur, f. o. b. Atlantic ports, is quoted at 10@11.5c. per unit for unwashed lump ore, and 9@10c. for fines.

The average prices of sulphur, f. o. b. Sicilian ports, for January, were as follows, per long ton:

	1904	1905
Best unmixed seconds	$19.99	$19.56
Best thirds	19.38	18.71
Current thirds	18.95	17.62
Refined block, bulk	21.63	21.57
Refined block, bags	22.29	22.29
Refined roll, bags	23.09	23.09
Refined roll, casks	24.42½	23.81
Ref. roll, sticks, usual size	25.27	25.03
Ref. roll, sticks, small	25.76½	25.52
Sublimed flowers, pure	26.24½	26.00
Subl. flowers, current	24.23½	24.30
Subl. flowers, commercial	22.96½	22.90
Best seconds, ground, bags	21.87½	21.37

Crude brimstone shows a reduction this year of 43c. per ton for best seconds, 67c. for best thirds, and $1.33 for current thirds. Refined and sublimed sulphur is practically unchanged in price.

Nitrate of Soda.—Quiet and firm. Refined quality for early delivery is quoted at $2.325@$2.35 per 100 lb., and for future shipment, $2.325 to $2.15, according to position, the lower figure ruling for second-half 1906. Ordinary quality 95% is worth 2.5c. per 100 lb. less than refined.

The statistical position of nitrate of soda in Europe for January compares with the same month last year as follows in long tons:

	1904.	1905.
Exports to Europe	90,232	106,714
Imports	160,610	74,270
Deliveries	66,780	67,850
Loadings for Europe, Feb. 1	69,782	77,168
Visible supply, Feb. 1	670,460	716,780

Notable changes this year were increases of 16,482 tons in exports to Europe, and 46,320 tons in the visible supply, and only 970 tons in deliveries; while imports—the smallest in four months—show a decrease of 86,340 tons as compared with January, 1904.

Sulphate of Amomnia.—Evidently foreign speculators are endeavoring to maintain present high prices for future shipment. Early shipments of foreign gas liquor are worth $3.275@$3.325 per 100 lb., and futures, $3.30@$3.325. Domestic, prompt, $3.175@$3.225, and forward, $3.20 @$3.25.

Phosphates.—Florida hard-rock miners report an improved demand for export in 1906, at better prices. Otherwise the market shows a waiting policy, that suggests buyers' and sellers' views are still too far apart to culminate in business.

Acid phosphates for domestic delivery shows a satisfactory demand, on the basis of 60c. per unit for 14@16% grade, in bulk at New York. At Southern points attention has been called to the shipments from Charleston, S. C., to Gulf ports, which is a departure of some interest. Apparently superphosphate manufacturers in South Carolina seek expansion.

Phosphates are quoted as follows, per ton:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla., hard rock	$7.25@7.50	$11.45@11.65
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.00@4.25	10.27@10.67
78%	3.75@4.00	.....
75%	3.25@3.50	.....
‡So. Car. land rock	3.25@3.50	.....
river rock	3.00@3.25	6.38@ 6.67
Algerian, 68@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr	.....	11.39

* F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant ‡ On vessel Ashley River, S. C.

Metal Market.

New York. Feb. 22.

Gold and Silver Exports and Imports.

At all United States Ports in January.

Metal.	1904.	1905.
Gold.		
Exports	$591,567	$16,828,168
Imports	8,225,508	1,895,691
Excess	I.$7,633,941	E.$14,932,477
Silver.		
Exports	4,986,894	4,364,745
Imports	2,609,372	1,922,202
Excess	E. $2,377,522	E.$2,442,543

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending February 18 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$964,300	$79,641	$537,151	$5,133
1905	28,511,165	492,938	4,642,234	124,931
1904	1,044,297	1,250,080	6,416,442	161,753
1903	284,278	673,248	2,795,403	126,713

Gold exports were chiefly to the West Indies and Argentina; imports mostly from Central America and the West Indies. Silver exports were principally to London; imports from Central and South America.

Exports of merchandise from the United States in January showed a decrease of $18,599,766, while imports increased $15,769,890. The statement of the Bureau of Statistics of the Department of Commerce and Labor for the month is as follows:

	1904.	1905.
Exports	$142,045,170	$123,445,404
Imports	82,589,866	98,358,756
Excess, exports	$59,455,304	$25,086,648
Add excess of exports, silver		2,442,543
Add excess of exports, gold		14,932,477
Total balance of exports		42,461,668

The gold and silver movement in detail will be found in the table at the head of this column.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending February 19, gives the following totals, comparisons being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts	$994,438,800	$1,136,012,100
Deposits	1,028,025,600	1,192,555,900
Circulation	40,551,600	42,852,100
Specie	213,606,700	220,953,800
Legal tenders	70,906,300	86,389,600
Total reserve	$284,513,000	$307,343,400
Legal requirements	257,006,400	298,138,975
Balance surplus	$27,506,600	$9,204,425

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
N. Y. Ass'd	$220,953,800	.....
England	184,483,810	.....
France	562,615,880	$220,485,880
Germany	208,175,000	69,395,000
Spain	74,655,000	100,575,000
Netherlands	29,763,500	31,190 000
Belgium	15,953,335	7,976,665
Italy	111,690,000	16,020,000
Russia	515,280,000	30,930,000
Austria	240,365,000	62,940,000

The returns of the Associated Banks of New York are of date February 18, and the others February 16, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market has been steady, without any fluctuation for several days. Futures have receded in price, and the market at close is quoted dull.

The United States Assay Office in New York reports receipts at 135,000 oz. of silver during the week.

Shipments of silver from London to the East for the year up to February 9 are reported by Messrs. Pixley & Abell's circular as follows:

	1904.	1905.	Changes.
India	£1,854,939	£927,500	D. £927,439
China	4,500	.....	D. 4,500
Straits	38,103	2,800	D. 35,303
Total	£1,897,542	£930,300	D. £967,242

Receipts for the week this year were £140,000 in bar silver from New York, £10,000 from the West Indies, and £4,000 from Australia; total, £154,000. Shipments were £150,000 in bar silver to Bombay.

Indian exchange continues steady, but the prospect is that it may be a little easier, owing to the large exports of merchandise to that country. The Council bills offered in London were all taken at an average of 16.03d. per rupee. Buying of silver for India has been only fair, though it is reported in London that the Indian government has been purchasing the metal quietly.

Imports and exports of silver at the port of San Francisco for the year were valued as follows:

	Imports.	Exports.	Excess.
Coin	$136,143	$2,956,170	E.$2,820,027
Bullion	3,081,233	4,626,166	E. 1,544,933
Total	$3,217,376	$7,582,336	E.$4,364,960
Total, 1903	2,949,792	1,862,060	I. 1,087,732
Changes	I. $267,584	I.5,720,276	.....

Exports of silver directly to the East, which were small in 1903, seem to have been resumed on a larger scale last year. The imports are from Mexico and South America chiefly.

The gold and silver movement in Great Britain for the month of January was as follows:

Gold:	1904.	1905.
Imports	£2,972,469	£3,023,010
Exports	3,141,431	2,888,495
Silver:		
Imports	1,185,970	1,275,555
Exports	1,538,524	1,107,527
Excess	E.£352,554	I. £168,028

Of the silver imported this year, £861,675, or 67.5% of the total, is credited to the United States.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.47½	$0.49½
Peruvian soles and Chilean pesos	.43½	.46
Victoria soverigns	4.85½	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

	Copper.			Tin.	Lead.	Spelter.	
February.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
16	15 @15½	14½ @15½	68½	29½	4.45	6.10 @6.15	5.95 @6.00
17	15 @15½	14½ @15½	68½	29½	4.45	6.10 @6.15	5.95 @6.00
18	15 @15½	14½ @15½	....	29	4.45	6.10 @6.15	5.95 @6.00
20	15 @15½	14½ @15½	68½	29	4.45	6.10 @6.15	5.95 @6.00
21	15 @15½	14½ @15½	68½	29½	4.45	6.10 @6.15	5.95 @6.00
22	.....	.....	.....	.....	.....	.....	.....

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars.

SILVER AND STERLING EXCHANGE.

February.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	February.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
16	4.87⅛	61⅛	28 1/16	20	4.8750	61	28 1/16
17	4.8770	61⅛	28 1/16	21	4.87⅛	61	28 1/16
18	4.8750	61	28 1/16	22	.....	.....	.....

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Copper.—The improvement abroad has made further progress, and although there has not been sufficient business done to affect prices, still such business as has been forthcoming has clearly shown that the requirements abroad are by no means supplied, and that exports are bound to continue on a liberal scale for some time to come. The domestic consumers have lately taken a rather conservative attitude towards the market, and although they are extremely busy with orders, have only been buying in moderate quantities. From this it would seem that a large percentage of the requirements remains uncovered while, on the other hand, the supplies in the hands of producers and dealers continue to be unusually small. The market closes steady and unchanged at 15@15¼ for Lake copper; 14⅞@15⅛ for electrolytic copper in ingots, cakes and wirebars, 14⅝@14⅞ in cathodes; 14½@14¾ for casting copper.

The market for standard copper in London, which has been right along, somewhat too low in comparison with the refined grades, has, during the past week moved up to about the relative price, and the closing quotations are cabled as £68 7s. 6d. for spot, £68 10s. for three months.

Statistics for the first half of February show an increase in the visible supplies of 85 tons.

Refined and manufactured sorts we quote: English tough, £70@£70 10s.; best selected, £70 10s.@£71; strong sheets, £79 10s.@£80; India sheets, £75 10s.@£76 10s.; yellow metal, 6⅝@6¾d.

Exports of copper from New York for the week ending February 20, were 5,988 long tons, principally to China and Germany. Imports for the week of February 17, were 94 tons copper, and $1,286 worth of ore, (quantity not given).

Imports of copper and copper material into Great Britain, with exports of copper, in the month of January, were as follows, in long tons, the totals giving the copper contents of all material:

	1904.	1905.	Changes.
Copper ore	8,206	9,239	I. 1,033
Matte and precipitate	4,056	4,892	I. 836
Fine copper	8,121	7,364	D. 757
Total imports in fine copper	10,970	10,734	D. 236
Exports	4,130	3,081	D. 1,049
Balance	6,840	7,653	I. 813

Of the imports in 1904, the United States furnished 3 tons of ore, 761 tons of matte and 4,152 tons of fine copper; in 1905 the receipts were 195 tons of matte and 4,027 tons of fine copper.

Imports and exports of copper in Germany for the full year were as follows, in metric tons:

	1903.	1904.	Changes.
Imports	83,261	110,231	I. 26,970
Exports	4,333	4,223	D. 110
Excess, imports	78,928	106,008	I. 27,080

Imports of copper ore were 13,914 tons in 1903 and 7,949 tons in 1904. Exports of copper ore were 15,986 tons in 1903 and 19,235 tons in 1904, an increase in exports, but a decrease in imports.

Tin.—While during the latter part of last week the market showed signs of weakness and spot tin sold as low as 29c., the offerings were readily absorbed by a very satisfactory consumption, and nearby shipment again rules at a slight premium. Quotations at the close are 29¼ for spot, 29c. for futures.

The foreign market, which closed last week at £132 10s., for spot, £131 for three months, opened on Monday at £131 7s. 6d. for spot, and there has been a further decline, the closing quotations on Tuesday, being cabled at £130 15s. for spot, £130 7s. 6d. for three months.

Imports of tin into Great Britain in January, with re-exports of foreign tin, were as follows, in long tons:

	1904.	1905.	Changes.
Straits	1,400	2,475	I. 1,075
Australia	330	400	I. 70
Other countries	468	79	D. 389
Total imports	2,198	2,954	I. 756
Re-exports	1,482	2,275	I. 793
Net imports	716	679	D. 37

A large part of the re-exports were Straits tin sent to the United States.

Imports and exports of tin in Germany for the full year are reported as follows, in metric tons:

	1903.	1904.	Changes.
Imports	13,925	14,352	I. 427
Exports	2,581	2,965	I. 384
Excess, imports	11,344	11,387	I. 43

The changes last year were small, the net imports being almost the same in both years.

Lead.—The demand is beginning to broaden and a fair volume of business has been transacted at the last prices. Quotations are unchanged at 4.37½ St. Louis, 4.45 New York.

The foreign market closes somewhat firmer at £12 10s. for Spanish lead, £12 12s. 6d. for English lead.

Imports and exports of lead in Great Britain in January were as follows, in long tons:

	1905.	1906.	Changes.
United States	2,989	1,500	D. 1,489
Spain	5,816	7,209	I. 1,393
Australia	7,322	12,684	I. 5,362
Germany	1,457	687	D. 770
Other countries	479	233	D. 246
Total imports	18,063	22,313	I. 4,250
Exports	2,848	2,808	D. 40
Balance	15,215	19,505	I. 4,290

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Imports and exports of lead in Germany for the full year were as follows, in metric tons:

	1903.	1904.	Changes.
Imports	52,440	61,388	I. 8,948
Exports	30,243	23,169	I. 7,074
Excess, imports	22,197	38,219	I. 16,022

Imports of lead ore were 67,573 tons in 1903, and 83,807 tons in 1904, an increase of 16,234 tons. Exports of ore were 1,270 tons in 1903, and 1,312 tons in 1904, an increase of 42 tons.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain under date of Feb. 4, that silver has been 14.75 reales per oz. Exchange is 33.08 pesetas to £1. Quotation for pig lead is 68.75 reales per quintal, which on current exchange, is equal to £11 10s. 8d. per long ton, f.o.b. Cartagena. Exports were 243 tons argentiferous lead, and 65 tons desilverized to Marseilles.

Spelter.—There is a decided improvement in the demand from galvanizers and a large business has been done at current prices. The closing quotations are unchanged at 6.10@6.15c. New York; 5.95@6c. St. Louis.

The foreign market is somewhat lower at £24 7s. 6d. for good ordinaries, £24 10s. for specials.

Imports and exports of zinc ore in Germany for the full year were as follows, in metric tons:

	1903.	1904.	Changes.
Imports	67,156	93,515	I. 26,359
Exports	40,460	40,488	I. 28
Excess, imports	26,696	53,027	I. 26,331

The large increase in imported ores was due, in part, to receipts from the Polish mines in Russia and in part to imports from Spain.

Imports and exports of spelter in Great Britain in January were as follows, in long tons:

	1904.	1905.	Changes.
Spelter	6,859	7,327	I. 468
Zinc sheets	1,609	1,725	I. 116
Total imports	8,468	9,052	I. 584
Exports	499	483	D. 16
Balance	7,969	8,569	I. 600

Imports of zinc ore are not given separately in the returns.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Feb. 4, that the local price for ores continues firm, notwithstanding the fall in exchange. Under the circumstances, prices paid by buyers look speculative. Quotations continue 75 fr. per ton for blende, 35% zinc, and 54 fr. for calamine, 30% zinc. Exports for the week were 2,000 tons blende to Stettin, 930 tons to Swansea, and 800 tons to Antwerp.

Antimony is unchanged. We quote Cookson's at 8¼@8½; Hallett's, 8@8¼; Hungarian, U. S., French, Italian, Japanese and Chinese, 8@8⅛ per pound.

Nickel.—Producers quote 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots is higher, according to quantity, running up to 60c. for small orders.

An exportation of 980 nickel plates, valued at $15,688, is noted this week from New York to Rotterdam.

Imports of metallic nickel into Germany were 1,507 metric tons in 1903, and 1,712 tons in 1904, an increase of 205 tons. Exports were 700 tons in 1903, and 1,203 tons in 1904, an increase of 503 tons.

Platinum.—Quotations are firm, at $19.50 per ounce.

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 74c.; crucibles and dishes, 78c.; perforated ware, 85c., and cones, $1 per gram.

Quicksilver.—Quicksilver continues quiet but steady, at $40 per flask in large lots, while $41.50 is the price for smaller orders. San Francisco prices are lower, $37.50@$39 per flask being quoted for domestic orders, with some discount for export. The London price is £7 12s. 6d., with the same figures quoted by second hands.

Imports of quicksilver into Great Britain in January were 17,210 lb. in 1904, and nothing in 1905. Re-exports of foreign metal were 244,045 lb. in 1904, and 286,150 lb. in 1905. These were drawn from stocks in both years.

Imports of quicksilver into Germany for the full year were 674 metric tons in 1903, and 691 tons in 1904, an increase of

17 tons. Exports were 62 tons in 1903, and 43 tons in 1904, a decrease of 19 tons.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kgs. or over at 710 marks per 100 kgs., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

Minor Metals and Alloys.—Thallium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg. f.o.b. Bremen, Germany. Manganese—tin alloy, 55%, is quoted 365 marks per 100 kg. for first quality, and 225 marks for second quality, both f.o.b. Bremen.

For other minor metals and their alloys, wholesale prices are f.o.b. works:

	Per lb.
Aluminum,	
No. 1, 99% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesium, pure (N. Y.)	$1.60
Manganese, (98@99% N. Y.)	75c.
Manganese Cu., (30@70% N. Y.)	40c.
Molybdenum, (98@99% N. Y.)	$2.75
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Prices vary chiefly according to size and terms of orders.

Missouri Ore Market.

JOPLIN, Feb. 18.

The highest price reported paid for zinc was $56, a decline of 50c per ton. The assay basis remained unchanged, at $51@$53 per ton. A year ago zinc sold at $38 per ton, or $15 less. The temperature has passed from the extreme of 25° below zero, on last Monday morning, to about 40° above, Saturday night, with a steady fall of snow reinforcing the ice and snow that have enveloped the mining districts for six consecutive weeks. It is acknowledged by all to be the longest, hardest and most severe winter known to this latitude. It has reduced the output of the seven weeks of the year to a total of 24,745 tons of zinc ore, against 28,303 tons for the same period of last year. As a record-breaker for high prices, 1905 also stands without a peer. The price, which began the year at $55, was run up to $60 for three weeks, and still holds firm at $56 per ton for the choicest ore. Buyers have no disposition to try to maintain arbitrarily so unbalanced a high price, yet it is beyond human disposition not to want to receive all the market will give, whether justly or unjustly bestowed by the purchasers. Lead sold at $57@$58 all week, the competition inaugurated by the St. Louis Smelting & Refining Co. still holding the market firm. Following are the shipments of zinc and lead for the week:

	Zinc, lb.	Lead, lb.	Value.
Joplin	1,977,750	151,290	$57,44
Carterville-Webb City	996,163	385,800	36,900
Duenweg	670,770	58,740	19,450
Badger	627,230	.....	17,560
Galena-Empire	286,740	29,670	8,300
Oronogo	308,200	3,300	8,240
Aurora	306,740	17,700	7,820
Carthage	258,480	.....	7,240
Neck City	209,110	.....	5,870
Sherwood	215,860	.....	5,830
Granby	180,000	11,000	3,020
Zincite	105,130	.....	2,840
Prosperity	35,100	64,560	2,790
Alba	64,460	.....	1,800
Totals	6,241,550	722,060	$185,400
Seven weeks	49,490,170	5,414,270	1,448,980

Zinc value, the week, 164,810; seven weeks, $1,288,510.

Lead value, the week, 20,590; seven weeks, $16,450.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.055	60.690	26.423	27.930
February	57.592	.....	26.665	.....
March	56.741	.....	26.164	.....
April	54.202	.....	24.974	.....
May	55.430	.....	25.578	.....
June	55.673	.....	25.644	.....
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

COPPER IN NEW YORK.

Month.	Electrolytic.		Lake.	
	1904.	1905.	1904.	1905.
January	12.410	15.008	12.553	15.128
February	12.063	.....	12.245	.....
March	12.299	.....	12.551	.....
April	12.923	.....	13.120	.....
May	12.758	.....	13 000	.....
June	12.269	.....	12.399	.....
July	12.380	.....	12.505	.....
August	12.343	.....	12.468	.....
September	12.495	.....	12.620	.....
October	12.993	.....	13.118	.....
November	14.284	.....	14.456	.....
December	14.661	.....	14.849	.....
Year	12.823	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	57.500	68.262	July.	57.256	.....
Feb.	56.500	.....	August	56.952	.....
March	57.321	.....	Sept.	57.645	.....
April	58.247	.....	Oct.	60.012	.....
May	57.321	.....	Nov.	65.085	.....
June	56.398	.....	Dec.	66.384	.....
			Av., year	58.857	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	190
Jan.	28.845	29.325	July.	26.573	.....
Feb.	28.087	.....	August	27.012	.....
March	28.317	.....	Sept.	27.780	.....
April	28.132	.....	Oct.	28.596	.....
May	27.718	.....	Nov.	29.185	.....
June	26.325	.....	Dec.	29.286	.....
			Av., year	27.986	.....

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	4.347	4.552	July.	4.192	.....
Feb.	4.375	.....	August	4.111	.....
March	4.475	.....	Sept.	4.200	.....
April	4.475	.....	Oct.	4.200	.....
May	4. 23	.....	Nov.	4.200	.....
June	4.496	.....	Dec.	4.600	.....
			Av., year	4.309	.....

SPELTER.

Month.	New York.		St. Louis.	
	1904.	1905.	1904.	1905.
January	4.863	6.190	4.673	6.032
February	4.916	.....	4.717	.....
March	5.057	.....	4.841	.....
April	5.219	.....	5.038	.....
May	5.031	.....	4.853	.....
June	4.760	.....	4.596	.....
July	4.873	.....	4.723	.....
August	4.866	.....	4.716	.....
September	5.046	.....	4.896	.....
October	5.181	.....	5.033	.....
November	5.513	.....	5.363	.....
December	5.872	.....	5.720	.....
Year	5.100	.....	4.931	.....

Dividends.

Company.	Payable.	Rate.	Amount
†Amalgamated Copper	Feb. 27	$0.50	$765,439
Amalgamated, extra	Feb. 27	.50	765,439
American Coal	Mar. 1	1.25	62,500
‡Associated Oil, Cal.	Feb. 1	.01¼	315,000
Atlantic Copper	Feb. 15	.50	50,000
Arizona Copper, def. ord	Feb. 23	1.83	115,468
Arizona Copper, pf. ord	Feb. 23	1.83	575,757
*Bunker Hill & Sullivan	Feb. 4	.25	75,000
Calumet & Arizona	Mar. 20	2.00	400,000
Cambria Steel	Feb 15	.75	675,000
†Camp Bird, Col.	Feb. 4	.18	147,600
*Caribou Oil, Cal.	Feb. 16	.07	5,600
*Central Eureka, Cal.	Feb. 11	.07	28,000
*Central Lead, Mo.	Feb. 28	.50	5,000
†Colo. & Hocking C. & I.	Feb. 15	.25	17,311
Esperanza, Mex.	Feb. 11	.12	54,600
†Federal Mg. & Sm. com	Mar. 15	2.50	125,000
†Federal pf.	Mar. 15	1.75	175,000
*Four Oil, Cal.	Feb. 15	.01	3,000
Gold King Con., Col	Feb. 15	.01	9,369
Greene Con. Copper	Feb. 20	.40	345,600
*Homestake, S. D.	Feb. 25	.25	54,600
Iron Silver, Col.	Mar. 4	.10	50,000
*Imperial Oil, Cal.	Feb. 6	.20	20,000
Jeff. & Clearf., c., pf	Feb. 15	2.50	37,500
*Lightner, Cal.	Feb. 20	.05	5,113
*Mines Co. of Am.	Feb. 20	.01½	30,000
Monte Cristo Oil, Cal	Feb. 10	.01	5,000
†National Carbon, pf.	Feb. 15	1.75	78,750
*National Lead, pf.	Mar. 15	1.75	260,820
*N. Y. & Hond. Rosario	Feb. 25	.40	15,000
*Oil City Petroleum, Cal.	Feb. 1	.00½	2,500
*Pacific Coast Borax	Feb. 28	1.00	19,000
Parrot, Mont.	Mar. 13	.50	114,925
*Peerless Oil, Cal	Feb. 1	.14	12,880
*Penna. Con., Cal.	Feb. 15	.10	5,150
*Peñoles, Mex.	Feb. 15	23.75	59,375
†Phila. Gas, com.	Feb. 1	.75	398,888
Phila. Gas, pf	Mar. 1	1.25	143,620
Quincy, Mich.	Feb. 26	3.00	300,000
*San Rafael.	Feb. 20	13.30	15,960
*San Rafael, aviado.	Feb. 20	5.30	6,360
*Soledad, Mex.	Feb. 20	7.13	6,840
*Sorpressa, Mex	Feb. 20	2.38	₤2,280
*Silver King, Utah.	Feb. 10	.66¾	100,000
†Standard Oil.	Mar. 15	15.00	14,550,000
Stratton's Independence	Feb. 28	.12½	125,001
†Tenn. C. & I., pf	Feb. 1	2.00	4,960
*Thirty-three Oil	Feb. 6	.10	10,000
†U. S. Steel, pf	Feb. 28	1.75	6,304,919
*Union Oil, Cal.	Feb. 20	.50	26,336
*United Petroleum, Cal.	Feb. 20	.80	₤11,744
United States, Utah.	Feb. 15	.50	210,000
‡Wolverine, Mich	Apr. 1	5.00	₤300,000

*Monthly. †Quarterly. ‡Semi-Annual.

Assessments.

Company.	Delinq.	Sale.	Amt.
Belcher, Nev.	Mar. 15	.....	.10
Blue Eagle, Utah	Mar. 4	Mar. 25	.00½
Bunker Hill, Cal	Mar. 1	.....	.05
Burlington, Utah	Feb. 15	Mar. 15	.00½
Caledonia, Nev.	Feb. 15	Mar. 8	.10
Columbus Con., Utah.	Feb. 11	Mar. 6	.20
Con. Cal. & Va., Nev	Feb. 7	Feb. 28	.25
Dagmar Northwest, Utah	Feb. 15	Mar. 10	.00½
Gould & Curry, Nev.	Feb. 24	Mar. 15	.10
Hale & Norcross, Nev	Mar. 7	.....	.10
Hardscrabble, Utah.	Jan. 31	Feb. 28	.00½
Highland Boy Con., Utah.	Feb. 4	Feb. 23	.00½
Jackson Butte, Cal.	Mar. 16	.....	.02
La Palma, Mex.	Mar. 6	.....	.04
Mayday, Cal.	Jan. 24	Mar. 7	.03
Mayflower, Utah.	Mar. 9	Mar. 25	.00½
Petro, Utah.	Feb. 18	Mar. 11	.03
Potosi, Nev.	Feb. 21	Mar. 15	.10
Seg. Belch. & Mides	Feb. 7	Feb. 27	.05
Sheba, Utah	Feb. 15	Mar. 10	.03
Silver Shield, Utah.	Mar. 7	.....	.01½
Union Con., Nev.	Feb. 24	Mar. 16	.15
West Century, Utah.	Feb. 20	Mar. 10	.00½

Salt Lake City. Feb. 17

Company.	Par Val	High.	Low.	Shares.
Ajax	$1	.13	.11	11,500
Carisa	1	.10½	.10	5,600
Congor	1	.12½	.12½	1,000
Daly	20	2.55	2.53	1,154
Daly-West	20	17.50	16.90	125
Grand Central	5	3.25	3.25	250
Horn Silver	2	1.50	1.50	20
Ingot	1	.02½	.02½	2,000
Little Chief	1	.02½	.02	10,500
Lo Mammoth	25	.13½	.12½	1,500
May Day	1	.11	.08½	32,200
Mammoth	1	1.25	1.25	200
Naildriver	1	.47½	.47½	500
New York		.55½	.51	11,250
Petro	1	.10	.09½	1,300
Sacramento		.10½	.10	3,200
Silver Shield	1	14½	.14	3,500
Star Consolidated	1	.13½	.12	3,000
Tetro	1	.19½	.18½	1,000
Uncle Sam Consolidated	1	.29½	.27	27,490
Wabash	1	1.90	1.75	700
Yankee Consolidated		.34	.33½	600

Total sales 129,839 shares.

STOCK QUOTATIONS.

Colorado Springs (By Telegraph).

Company	Feb. 20 H.	Feb. 20 L.	Feb. 21 H.	Feb. 21 L.
Anaconda	.20	.19¾		
C. K. & N.	.22	.21		
Cripple Ck. Con.	.14	.13½		
Doctor Jack Pot	.03½	.03½		
Elkton Con.	.71	.70½		
El Paso.	2.05	1.99½		
Isabella.	.35	.34½		
Moon Anchor.	.06½	.06½		
Old Gold.	.09½	.07½		
Portland.	1.85½	1.84½		
Vindicator Con.	.86	.85		
Work	.60½	.60½		

Ishpeming, Mich.*

Feb. 18

Company.	Par Val.	H.	L.
Black Mountain	$1	$2.50	$2.40
Calumet & Arizona.	10	116.00	115.00
Calumet & Pittsburg	10	53.00	47.75
Junction Development	10	113.00	110.00
Lake Superior & Pittsburg	10	52.75	51.00
Pittsburg & Duluth (full paid)	15	32.75	31.00

*By The Wallace H. Hopkins Co.

St. Louis, Mo.*

Feb. 18.

Company.	Par Val.	Bid.	Ask.
Am. Nettie, Colo.	$10	$0.15	$0.20
Center Creek.	10	1.50	1.75
Central Coal & C.	100	63.00	65.00
Central C. & C., Pf.	100	74.00	76.00
Central Lead, Mo.	100	120.00	125.00
Columbia Lead Mo.	10	.25	1.90
Con. Coal, Ill	100	21.50	26.00
Doe Run Lead, Mo.	100	117.50	125.00
Granite Bimet., Mont.	10	.35	.40
St. Joe Lead, Mo.	10	17.00	17.50

*By our Special Correspondent.

Montreal.*

Feb. 18

Company	Par Val.	High.	Low.	Sales.
Dominion Coal.	100	66.50	65.50	410
Dominion Coal, Pf.	100			
Dom. I. & St.	100	18.50	18.00	1.280
Dom. I. & St., Pf.	100	64.00	63.50	310
Montreal Steel	100	80.00	79.50	111
Montreal Steel, Pf	100	109.50	107.50	150
Nova Scotia St.	100	69.00	66.62½	2.079
N. S. Steel, Pf.	100	112.00		10

*Montreal Stock Exchange.
Total sales, 4.350 shares.

San Francisco.*

Feb. 15

Company.	Location.	Opening. H.	Opening. L.	Closing. H.	Closing. L.	Sales.
MacNamara.	Nev.	.58	.57	.63	.59	39,150
Mont. Tonopah	Nev.	2.75	2.70	3.07½	3.05	13,600
Ton. Belmont	Nev.	.91		1.25		1,750
Ton. Midway	Nev.	1.00				1,800
Ton. Mg. Co.	Nev.			1225		100
Ton. North Star	Nev.	.45	.44	.62	.58	39,100

*San Francisco & Tonopah Exchange.
Total sales, 95.500 shares.

San Francisco (By Telegraph).

Company.	February 20*	February 21
Belcher		.18
Best & Belcher.		1.10
Caledonia		.63
Challenge Con.		.25
Chollar.		.23
Confidence		.86
Con. California & Virginia.		2.05
Crown Point.		.15
Gould & Curry		.18
Hale & Norcross.		1.55
Mexican.		2.10
Ophir		7.37½
Overman		.22
Sierra Nevada.		.36
Union Con.		.60
Yellow Jacket		.22

*Quotations not received.

New York.

Company.	Par Val.	Feb. 15 H.	Feb. 15 L.	Feb. 16 H.	Feb. 16 L.	Feb. 17 H.	Feb. 17 L.	Feb. 18 H.	Feb. 18 L.	Feb. 20 H.	Feb. 20 L.	Feb. 21 H.	Feb. 21 L.	Sales
Amalgamated	100	75½	74	75½	74½	74¾	73½	74½	73¾	76	74			206,200
Anaconda	25	108	107	108	107	106½	106			108½	105½			7,300
Best & Belcher	3													
Brunswick	1			.06						.06				2,100
Caledonia	1			.70						.50				300
Challenge	2½							.20						200
Chollar	2½													
Chrysolite	50	.06												1,000
Confidence	3					.80								200
Con. Cal. & Va.	2½	2.10								2.10				410
Crescent	10	.05												100
Daly	20													
Elkton Con.	1			.71	.70	.71				.72				1,000
Federal Mining and Smelting	100	99	97	99	96½	104½	99	109½	104½	120	111			7,400
Preferred	100	93	91½	93	92	93½	92½	93½	93	96½	94½			32,060
Greene Consolidated Copper	10	27½	27	28½	27½	28¼	27½	28¼	28	28¼	27½			22,300
Greene Consolidated Gold	10	7		7		7	6½	6½	6½	6½	6½			6,000
Hale & Norcross	3							1.40						100
Homestake	100					74								20
Horn Silver	20	1.75												100
Iron Silver	20													
Isabella	1			.32										30
Little Chief		.05						.05						500
Mexican	32	2.20	2.10	2.15										300
Mollie Gibson	5													
Occidental	3													
Ontario	100			3.85										50
Ophir	3					7.00				712½				200
Phoenix	1	.10		.10		.10	.09			.10				2,100
Portland	1	1.80						1.85						200
Potosi	1	.15	.12	.20						.18				1,500
Quicksilver	100													
Quicksilver, pf.	100									4.50				100
Savage	3			.37	.36	.36				.32				700
Sierra Nevada	3	.38				.34				.50	49			700
Silver Hill	1							.65	.64					300
Small Hopes	20													
Standard Con	10					1.75								100
Tennessee Copper Common	25	32½	31½	31½		31				30				1,200
Union Consolidated	1													
United Copper	100	7½	7½							8	7			1,600
Yellow Jacket	3													

Total sales, 296,370 shares.

Boston.

Company.	Par Val.	Feb. 15 H.	Feb. 15 L.	Feb. 16 H.	Feb. 16 L.	Feb 17. H.	Feb 17. L.	Feb. 18 H.	Feb. 18 L.	Feb. 20 H.	Feb. 20 L.	Feb. 21* H.	Feb. 21* L.	Sales.
Adventure Con	$25	7		7		7½	7			2½	7			510
Allouez.	25	20½	20	20½	20½	20½	20½	20½	20½	22	20½			5,282
Amalgamated	100	75½	74½	75½	74½	74½	73½	74½	74	76	74½			18,945
Am. Z. L. & Sm.	25	11												50
Anaconda	25					26½								100
Arcadian	25	1				1½								25
Arnold	25													
Ash Bed	25	.40	.20	.60	.35	.50	.45							5,330
Atlantic	25	17½	17	17½	17			17		17½	17			1,268
Bingham Con.	50	32½		33½	32½	32½	32	32½	32½	32½				932
Bonanza Dev. Co.	10					75								100
Boston Con.	10	7½	7	7		7½	7			7				3,160
Calumet & Hecla.	25	680		680	675	692	685	690		695	690			323
Centennial	25	20½	19½	20½	19½	20	19½	20½	20	20½	20½			2,405
Con. Mercur	5	.39		.39	.38									650
Continental Zinc	25													
Copper Range	100	69½	69	69½	69	71½	69	71½	70½	71½	70½			15,362
Crescent	10													
Daly-West.	20	18½	16	18½	17	18	17½	18	17½	18	17½			6,368
Elm River	12					2½				3	2½			670
Franklin.	25	11½	11			11½	10½	11		11½	11			540
Granby Con.	10	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½			10,340
Greene Con	10	27½	26½	28½	27½	28	27½	28	27½	28½	27½			14,541
Guanjuato Con.	10	4	3½	4	3½					3½				1,470
Humboldt	25	1½												200
Isle Royale Con.	25			25½		26	25½	26	25	26				614
Mass Con	25	12½	12	12½	11½	12	11½	12½	11½	13½	12½			7 203
Mayflower	25													
Michigan	25	13½	13	63½	13	13½	12½	14½	13½	15½	14½			13.280
Mohawk.	25	54	53	54	53½			54½	53½	54½	54			2,328
Montana Coal & Coke.	25	4½		4½		4½		4½						165
National.	25													
New Idria	$5													
Old Colony.	25													
Old Dominion	25	27		27	26½	26½	26	26		27½	27			1,830
Osceola.	25	93	93	92½	92	92½	92	93	92½	93	92½			1,112
Parrot.	10	29		29		29	28½	29	28½	29				200
Phoenix Con.	25	2½		2½	2½									215
Quincy	25	110	108			107	106			110½				170
Rhode Island.	25			2½	2	2½	2½	2						445
Santa Fe.	10													
Shannon.	10	7½	7	7½	7			7½	7	7½	7			3,737
Tamarack	25	133	130			131				134	130½			72
Tecumseh	25	2½		2½				2½						150
Tennessee	25													
Trinity	25	11½	10½	11½	11	11½	10½	11½	11	11½	11			5,001
Union Cop. L'd. & Mg.	25													
United States	25	24½	24	24½	24	24½	24	24½	24½	25½	24½			8,619
U. S. Coal & Oil.	25	9½		9½		10		10						505
Utah Con.	5	42	41½	42		42	41½	42		42½	42			2,764
Victoria	25	5		5		5½	5	5		5½	5			2,165
Winona	25	12	11½	12	11½	12	11½	12½	12	13½	12½			4,290
Wolverine	25	118	113	120	118	120	119			119	117½			1,400
Wyandot	25							2½	2	2½	2			2,340

Total sales, 147,176 shares.

STOCK QUOTATIONS.

Coal, Iron and Industrial Shares.

Company.	Par Val.	Feb. 15		Feb. 16		Feb. 17		Feb. 18		Feb. 20		Feb. 21		Sales.
		H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allis-Chalmers	$100	16½	16⅛	18⅛	16½	19	17½	18¼	17⅞	18¾	18	....	....	17,200
Preferred	100	....	....	66	64¾	68	65¾	67½	66¾	66½	....	....	....	6,300
Am. Agri. Chem.	100	....	....	....	....	22½	21¾	....	....	....	....	....	....	1,400
Preferred	100	....	....	92	....	....	....	....	....	90½	....	....	....	125
Am. Sm. & Ref.	100	85⅜	85½	86½	85	87⅜	85⅜	88⅜	87⅜	90	88⅜	....	....	82,150
Preferred	100	117¼	117½	117½	116¾	118½	117½	118½	118	119	118½	....	....	5,898
†Cambria Iron	50	....	....	49	....	49	....	....	....	49	....	....	....	42
†Cambria Steel	50	27⅜	26⅜	28½	27⅜	28¾	27⅜	28½	27¾	28	27¾	....	....	40,040
Col. Fuel & Iron.	100	52	51	52½	50½	51⅞	50½	51¼	50¼	52¼	50¼	....	....	59,730
Col. Fuel & Iron pf	100	....	....	....	....	....	....	100	....	100	....	....	....	200
Col. & H. C. & I	100	16½	16	16⅜	16½	16¼	....	16½	16¼	16½	....	....	....	1,300
General Chem	100	....	....	....	....	....	....	....	....	....	....	....	....	....
General Chem. pf	100	104	103	....	....	....	....	....	....	....	....	....	....	200
†Lehigh Nav.	50	110½	110	....	....	109	....	109	....	109	....	....	....	674
*Mong. R. Coal	100	....	....	9¼	....	....	....	....	....	....	....	....	....	50
*Mong. R. Coal pf.	100	28½	28	....	....	....	....	....	....	27½	....	....	....	170
National Lead	100	32⅜	31½	33⅜	32½	34½	33¼	37⅜	34¾	39¼	37⅜	....	....	84,078
Preferred	100	103½	....	103¾	....	107	103¼	109	108½	111½	109¾	....	....	4,001
Phila. Nat. Gas	50	42¼	42⅜	44¼	42¾	44½	44	44½	44¼	45½	44½	....	....	35,003
Preferred	50	47	46½	48	47½	48½	48	48	....	48	47½	....	....	3,492
Pittsburg Coal	100	21½	21⅛	21½	21⅛	....	....	21¾	....	....	....	....	....	1,700
Preferred	100	80⅜	80	80½	80	80½	80	80½	80	80½	80	....	....	2,647
Republic I.*& S.	100	18½	18	18⅜	18	18½	18	18⅜	18	19⅜	18½	....	....	29,910
Preferred	100	76	75	77½	76	77⅛	76	76	75½	77⅜	76¼	....	....	29,700
Sloss Shef. S. & I.	100	70⅜	69½	75½	70	76	74½	75½	74¼	79¼	75½	....	....	31,600
Preferred	100	....	....	....	....	107½	....	....	....	110	109	....	....	300
Standard Oil	100	....	....	644	642	638	634	685	630	615§	610	....	....	300
Tenn. C. I. & R. R.	100	81⅞	80½	82¼	81	82½	81	81⅜	80½	....	....	....	....	64,520
U. S. Steel Corp	100	32	31⅜	32¼	32	32½	32	32½	31¾	33½	31½	....	....	383,490
Preferred	100	95	94½	95½	94⅜	95	94½	94¾	94¼	95½	94½	....	....	140,850
Va. Car. Chem	100	38⅜	37½	39	38½	39	38¼	38	38¼	38½	37⅝	....	....	11,380
Preferred	100	108½	108½	109	108½	109½	108½	109½	109½	110	104⅜	....	....	2,150

*Pittsburg Exchange; †Philadelphia Exchange; all others, New York Stock Exchange; Total sales, 1,040,300 shares. §Ex dividend.

Mexico.

Feb. 10.

Company.	Shares Issued.	Prices, Mex. Bid.	Prices, Mex. Ask.
DURANGO:			
Penoles	2,500	$2,600	$3,000
San Andres de la Sierra	200	10,000	.....
GUANAJUATO:			
Cinco Senores y An. aviadoras	2,000	12	18
Cinco, Senores y An. aviada	400	30	40
Providencia, San Juan de la Luz	6,000	150	155
GUERRERO:			
Garduno y Anexas	7,200	30	35
HIDALGO:			
Amistad y Con	9,600	65	68
Carmen, aviada	1,100	220	250
Guadalupe Fresnillo. Mill	1,000	170	200
Guadalupe Fresnillo Mine	1,400	70	80
Maravillas y An., aviador	1,680	90	110
Maravillas el Lobo	1,000	130	180
Refugio, aviada	12,800	5	7
Sta. Gertrudis y An aviadas	9,600	7	10
Sta. Gertrudis y An., aviadora	28,800	73	74
San Rafael y An., Trompillo	1,200	2,150	2,180
San Rafael y An., aviada	1,200	$760	$790
Soledad, aviada	670	1,150	1,175
Sorpresa, aviada	960	306	315
MEXICO.			
Aldebarren	2,000	20	25
Buen Despacho	3,000	40	48
Dos Estrellas	3,000	3.500	3,550
La Esperanza (El Oro)	3,000	1,500	1,500
Santa Ana, Esperanza	2,400	15	30
NUEVO LEON:			
La Fraternal	1,000	580	620
Norias de Bajan	1,000	700	750
SAN LUIS POTOSI:			
Concepcion y An.	3,000	26	30
El Barreno, aviadora	2,000	103	107
Sta. Maria de la Paz	9,600	249	250
ZACATECAS:			
Asturiana y An	2,500	8	12
Candelaria y Pinos	2,500	40	60
San Carlos y Annexas	2,500	15	20
Sta. Maria de Gaud.	2,500	79	85
MISCELLANEOUS:			
Bartolome de Medina	2,000	82	87
Naica (Chihuahua)	100	11,000	13,000
Natividad (Oxaca) aviadora	1,800	650	750
San Francisco Hac.	6,000	91	93
Union Hacienda	3,000	310	350

Paris.

Feb.

Company.	Location.	Par value.	Latest dividend.	Prices. Opening.	Prices. Closing.
		Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	2,000	75.00	1,895.00	1,875.00
Anzin, Coal	France	.....	290.00	5,645.00	5,790.00
Biache-St. Vaast	France	1,000	160.00	3,605.00	3,605.00
Boleo, c	Lower California	500	104.17	2,680.00	2,650.00
Bruay, Coal	France	400	27.50	719.00	735.00
Courrieres, Coal	France	500	110.00	2,891.00	2,910.00
Escombrera-Bleyberg,z.l.	France	350	35.00	740.00	702.00
Huanchaca, s	Bolivia	125	2.50	89.25	88.25
Laurium, z. l.	Greece	500	25.00	330.00	338.00
Malfidano, z	Italy	500	50.00	625.00	640.00
Metaux, Cie. Fran. de,	France	500	22.50	515.00	525.00
Mokta-el-Hadid, i. l.	Algeria	500	40.00	1,015.00	1,045.00
Nickel, n	N. Caledonia	250	22.50	650.00	665.00
Penarroya, Coal	Spain	500	45.00	1,155.00	1,165.00
Vielle Montagne, z	Belgium	30	30.00	848.00	841.00

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. s—Silver. z—Zinc.

London.

Feb. 10.

Company.	Par Val.	Latest dividend. Amt.	Latest dividend. Date.	Quotations. Buyers.	Quotations. Sellers.
American:	£ s.	s. d.		£ s. d.	£ s. d.
Alaska-Treadwell	5 0	4 0	Jan., 1905	5 7 6	5 12 6
Anaconda	5 0	2 0	Nov., 1904	5 6 3	5 8 9
*Camp Bird	1 0	9	Feb., 1905	1 12 6	1 13 9
Copiapo	2 0	5 0	Oct., 1904	1 10 0	1 15 0
De Lamar	1 0	2 0	Nov., 1904	15 0	17 6
El Oro	1 0	9	July, 1904	1 1 3	1 3 9
Frontino & Bolivia	1 0	rts.	Mar., 1904	14 0	15 0
Le Roi	5 0	5 0	Nov., 1899	12 6	15 0
*Le Roi No. 2	5 0	2 0	Jan., 1905	16 3	18 9
Mesquital	1 0	3	Feb., 1903	2 6	3 0
Montana	1 0	6	Apr., 1899	6	1 0
Palmarejo & Mex.	1 0	3	Nov., 1904	14 0	15 0
Stratton's Indep'd.	1 0	6	Feb., 1905	5 9	6 3
St. John del Rey	1 0	6	Dec., 1904	12 0	13 0
Tomboy	1 0	1 0	Dec., 1904	1 5 0	1 7 6
Tyee	1 0	2 0	Dec., 1904	2 0 0	2 2 6
*Utah, Con	1 0	6 0	Jan., 1905	8 7 6	8 12 6
Ymir	1 0	1 0	Mar., 1902	2 6	5 0
European:					
Libiola	5 0	1 6	May, 1904	1 11 3	1 13 9
Linares	3 0	5 0	Sept., 1904	4 0 0	4 10 0
Mason & Barry	1 0	7 0	May, 1904	3 0 0	3 2 6
Rio Tinto	5 0	32 6	Nov., 1904	63 5 0	63 10 0
Rio Tinto, pf	5 0	2 6	Nov., 1904	6 2 6	6 7 6
Tharsis	2 0	7 0	May, 1904	5 10 0	5 12 6
West Australian:					
Associated	1 0	2 6	July, 1904	1 17 6	1 18 9
Cosmopolitan	1 0	1 0	Apr., 1904	5 0	5 6
Golden Horseshoe	5 0	6 0	Nov., 1904	6 11 3	6 13 9
Great Boulder	2	9	Dec., 1904	1 0 3	1 0 9
Gt. Boulder Perse	1 0	1 0	Sept., 1904	12 3	12 9
Great Fingall	1 0	7 6	Jan., 1905	7 17 6	8 0 0
Ivanhoe	5 0	5 0	Jan., 1905	7 12 6	7 15 0
Kalgurli	1 0	2 6	Jan., 1905	6 16 3	6 18 9
Lake View	1 0	1 6	Oct., 1904	1 6 3	1 7 6
Oroya-Brownhill	1 0	4 0	Dec., 1904	3 10 0	3 11 3
Miscellaneous:					
Brilliant Central	1 0	6	Feb., 1905	18 9	1 1 3
Brilliant & St. Geo.	10	6	Feb., 1905	1 1 6	1 2 6
Briseis Tin	1 0	.....	.....	10 6	11 6
Broken Hill	8	1 6	Feb., 1905	2 3 6	2 4 6
Mt. Lyell	3 0	1 3	Dec., 1904	13 6	14 6
*Mt. Morgan	1 0	3	Feb., 1905	2 15 0	3 0 0
Waihi	1 0	2 6	Mar., 1905	6 11 3	6 13 9
Indian:					
Champion Reef	10	1 5	Jan., 1905	1 13 0	1 14 0
Mysore	10	4 6	Nov., 1904	6 11 3	6 13 9
Nundydroog	10	1 6	Nov., 1904	1 7 6	1 8 9
Ooregum	10	9	Dec., 1904	16 11	17 7
Ooregum, pf	10	9	Dec., 1904	1 3 9	1 6 3
South African:					
Angelo	1 0	5 0	Feb., 1905	7 0 0	7 2 6
*Bonanza	1 0	7 0	Feb., 1905	1 0 0	1 5 0
British So. Africa	1 0	rts.	May, 1899	1 13 9	1 16 3
Cape Copper	2 0	6	Jan. 1905	4 0 0	4 5 0
Cape Copper, pf	2 0	6	Jan., 1905	3 15 0	4 0 0
City & Suburban	4 0	6 0	Feb., 1905	5 17 6	6 2 6
Consol. Gold-F'ids.	1 0	2 6	Dec., 1904	7 17 6	7 18 9
Crown Reef	1 0	18 0	Nov., 1904	15 5 0	15 15 0
De Beers, preferred	2 10	10 0	Feb., 1905	17 18 9	18 1 3
De Beers, deferred	2 10	2 0	Feb., 1905	17 16 3	17 18 9
East Rand	1 0	4 0	Feb., 1905	8 11 3	8 13 9
*Ferreira	1 0	27 6	Feb., 1905	23 0 0	23 10 0
*Geldenhuis	1 0	5 0	Feb., 1905	5 5 0	5 7 6
Geduld	1 0	rts.	Mar., 1902	6 18 9	7 0 0
*Henry Nourse	1 0	8 0	Feb., 1905	7 12 6	7 17 6
Heriot	1 0	5 0	Sept., 1899	4 0 0	4 5 0
Jubilee	1 0	5 0	Feb., 1905	3 15 0	4 0 0
Jumpers	1 0	2 6	May, 1904	2 2 6	2 7 6
Knights	1 0	.....	.....	5 18 9	6 1 3
Langlaagte	1 0	2 0	Feb., 1905	3 12 6	3 15 0
*May	1 0	4 0	Feb., 1905	4 0 0	4 2 6
*Meyer & Charlton	1 0	5 0	Feb., 1905	5 0 0	5 5 0
Modderfontein	1 0	rts.	Apr., 1902	10 11 3	10 13 9
Namaqua	2 0	3 0	Dec., 1904	3 15 0	3 17 6
New Goch	1 0	.....	.....	3 5 0	3 7 6
New Kleinfontein	1 0	rts.	Apr., 1902	2 6 3	2 8 9
New Primrose	1 0	3 0	Feb., 1905	3 5 0	3 7 6
Rand		5 0	Aug. 1904	10 16 3	10 17 6
Randfontein	1 0	rts.	Apr., 1899	2 18 9	3 0 0
*Robinson	5 0	8 0	Feb., 1905	9 15 0	10 0 0
*Robinson Deep	1 0	3 0	Aug., 1904	6 6 3	6 8 9
*Rose Deep	1 0	3 0	Feb., 1905	8 5 0	8 10 0
*Salisbury	1 0	2 0	Jan. 1905	1 10 0	1 15 0
Sheba	1 0	rts.	Feb., 1904	8 0	8 6
Simmer & Jack	1 0	6	Aug., 1904	2 2 6	2 3 9
*Village Main Reef	1 0	4 0	Jan., 1905	6 10 0	6 15 0
*Wemmer	1 0	12 6	Dec., 1904	9 5 0	9 15 0

*Ex-dividend.

London (By Cable).*

Company.	Feb. 21 £	s.	d.	Company.	Feb. 21 £	s.	d.
Camp Bird	1	14	6	Esperanza	1	0	9
Con. Gold Fields	7	17	6	Modderfontein	10	12	6
De Beers	18	7	6	Rand Mines	10	17	6
Dolores	1	8	0	Rio Tinto	65	7	6
East Rand	8	8	9	Simmer & Jack	2	3	9
El Oro	1	1	10½	Tomboy	1	7	6

*Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Stratigraphic Terms.—Will you kindly define the following terms: Paleozoic, Cambrian and pre-Cambrian, Devonian, Cretaceous, Glacial period?—N. A. D.

Answer.—For convenience in the study of historical geology, the earth's life has been divided arbitrarily into five eras of time, the key to the division being found in the rock strata, the successive groups of which are called respectively by the same names as the eras during which they were formed. Each era is further divided into periods, the points of division usually being marked by profound geological changes, or by marked transitions in the advance of life on the earth.

The earliest subdivision of time during which life is known to have been extant, is named the Cambrian period. Pre-Cambrian is a general term covering time earlier than Cambrian and all rocks older than those in which the first traces of living organisms are discernible. In refined discussion, this earliest of all time is divided into two eras, but pre-Cambrian is a safe and non-committal term.

The periods next succeeding the Cambrian are named Ordovician, Silurian, Devonian, or "Age of Fishes," and Carboniferous, the five periods together constituting the Paleozoic era. The next succeeding era is the Mesozoic, of whose three divisions the Cretaceous period is the most recent. The Glacial period marked the beginning of the era in which we now are, the Quaternary or Pleistocene. During that period the ice mantle, which is now confined to the polar regions, advanced southward as far as Ohio, the grooved and polished rock surfaces and the mounds of gravel and clay being the visible traces of ice movement during this period.

Any good text-book treats fully of this most interesting historical geology. We should recommend Archibald Giekie's Class Book as one of the most readable and exhaustive of the smaller works.

Manganese in Iron Ore.—What effect has the presence of manganese in iron ore upon the market price of the ore, and what effect has it upon the properties of the resulting iron and steel? If it is considered detrimental when present in certain quantities, between what limits is it so considered? What are the best reference books upon the subject of impurities of iron ores, their effect upon the properties of the resulting iron and steel, and the blast furnace treatment of these ores?—M. E.

Answer.—By your question, we judge that it covers iron ore carrying low percentages of manganese. Where the proportion of manganese runs high enough to make the ore attractive for the manufacture of spiegeleisen, or ferro-manganese, it reaches the point where it may be considered a manganese ore rather than an iron ore, and comes under different rules, so far as prices and sales are concerned. For most purposes, a small percentage of manganese in the iron ore is not considered detrimental. Where 2% of manganese, for instance, is present, the manganese will nearly all be carried away in an ordinarily acid slag, and will also serve to remove the sulphur. Where the percentage of manganese is higher, say up to 8%, the manganese will be alloyed with the iron. In this case also it will serve to remove the sulphur, so that high manganese iron generally contains low silicon and always low sulphur. For certain purposes, especially in making castings, a moderate percentage of manganese in the iron is not detrimental, and in manufacturing steel alloys, it may be advantageous. In most cases, a moderate manganese content makes little or no difference in the price of the ore. Thus, an ore containing 40% iron and 4% manganese, with 0.67 phosphorus, sells at about the same price as other non-bessemer ores free from manganese. Ores carrying 56% iron and 7% manganese, with low phosphorus, have sold at about the same range as bessemer ores. An ore carrying 44% iron and 7% manganese has sold slightly above a similar ore free from manganese. The variations are many, and depend largely upon the requirements of buyers. Ordinarily speaking, however, a content of 2% to 8% manganese would not materially affect the selling price of ores. Beyond that point, however, as was said above, the ore might be used for the manufacture of spiegel, and would bring a little higher price.

Probably the best book you could consult would be Campbell's 'Manufacture and Properties of Iron and Steel.' You will find much in that book concerning the effect of manganese, especially in steel.

A furnace has been designed by M. A. Gomes for the purpose of obtaining very high temperatures, using the reflected solar heat. Temperatures above 3,500° C. —higher than that of the electric furnace —are looked for. The reflector is built up of 6,170 elementary mirrors, each 122 mm. by 100 mm., arranged side by side in parallel rows, and are attached by threaded standards to a series of parallel angle irons, which run horizontally across the frame. The width at the top is 35 ft., at base 18 ft., and depth 35 ft.

Recent Decisions.

SPECIALLY REPORTED.

CONSTRUCTION OF AN OHIO OIL LEASE. —A grant to a corporation, its successors and assigns, of all the oil and gas in and under a tract of land, on consideration that the second party shall drill a well within six months, or thereafter pay a certain annual sum, or reconvey the property to the first party, and that the lessee may at any time remove its property and reconvey the premises, whereupon the lease shall be void, after six months, and until a well is drilled, is a lease at an annual rental, at the option of the lessee only.—Central Ohio Natural Gas & Fuel Company v. Eckert (71 *Northeastern Reporter,* 281); Supreme Court of Ohio.

CLAIMANT NOT DEPRIVED OF RIGHTS WHERE LAND DEPARTMENT FAILS TO ACT. —Where on an application for a patent to a lode claim, the Interior Department suspended the entry, and required the entryman within 60 days to elect which of two disconnected tracts included in the entry he would receive a patent for, and, in case of his failure to elect, the entry as to a portion of the claim in controversy should be canceled without notice, the failure of the entryman to appeal from such holding did not operate to cancel the entry at the expiration of the time allowed for an appeal, no election having been filed, and the Land Department not having taken any steps to enforce such election or cancel the entry.—Small v. Brown (77 *Pacific Reporter,* 358); Supreme Court of Colorado.

CONSTRUCTION OF RIGHTS UNDER MISSOURI STATUTE REGARDING MINING LANDS. —The Revised Statutes of Missouri, 1899, section 8766, provides that the owner or lessee of mining lands may post regulations for mining the lands, with the time during which the right to mine shall continue, and that any one desiring to mine must sign the register kept for that purpose, and thereby has the privilege of beginning mining as a licensee for the time and under the restrictions and conditions of the rules. Section 8767 provides that if such owner or lessee shall fail to comply with former section, and shall notwithstanding such failure permit persons to enter and mine their property, the right shall continue for a period of three years. A lessee of mining lands failed to include in its rules the time during which a miner's right should continue. A party registered and then assigned his rights to another, in consideration of a royalty, so long as such party should operate. The party operated over three years, having at the end of three years registered the lands himself. It was held that the royalty provided for continued only for the three year period.—Ashcraft v. Englewood Mining Company (81 *Southwestern Reporter,* 469); Appellate Court of Missouri.

Abstracts of Official Reports.

Maryland Coal Company.

This company owns a considerable property in the George's Creek coal region, in Maryland. Its balance sheet shows that the capital stock authorized is $2,000,000, divided as follows: Common stock, $11,100; preferred stock issued, $1,885,005; stock in treasury, $103,895. Included in the assets are $105,000 stock of the Georges Creek & Cumberland railroad, and $1,032,508 in various railroad securities, valued on the books at cost.

The coal production in 1904, the year covered by the report, was 322,080 tons, of which 44,754 tons were sold to local and line trade, and 277,326 tons were shipped by the Pennsylvania railroad. This total compares with 308,469 tons in 1903 and 373,398 tons in 1902.

The profit and loss statement for the year is as follows:

Coal account	$995,079
Coal on hand, at cost	10,419
Interest received, etc.	59,186
Total credits	$1,064,684
Freight, mining and general expenses	$767,305
Taxes	20,923
Total charges	$788,228
Net profit	$276,456

Receipts on coal account were $3.12, and expenses $2.45 per ton of coal sold.

Out of the net profits, dividends amounting to $160,200, being 8.5% on the preferred stock, were paid, leaving a surplus of $116,256, which was distributed to the credit of the following accounts: Improvements, $1,639; real estate, $114,000; profit and loss, $617. The total balance of profit and loss was $61,978 at the close of the year.

The president's report says: "Contracts have been signed for the construction of the buildings, railroad tracks, etc., at our new mines, located at Wendel, W. Va., and it is expected that we will be equipped to commence mining operations by Sept. 1, 1905.

"Acknowledgments are due to our mine superintendent, Mr. Frank E. Brackett, and his assistants, and also to the representatives and agents of the company, for the careful handling of our business during the year."

Pressed Steel Car Co.

The end of the year 1904 showed a loss of $707,110 on the year's operations. This unsatisfactory record is due to the irregularity in the demand for cars. Railroads and other users need, for replacement and new equipment, about 195,000 cars every year. During 1903 only 110,000 cars were ordered, and these all in the early months. Demand during 1904, on the other hand, came in the late months and called for 130,000 cars.

The outlook is bright, however, heavy orders having been received. Many improvements of plant were made during the year, particularly an addition to the facilities for manufacturing tank cars.

Pittsburg Coal Company.

This company owns and works extensive coal properties in the Pittsburg district in Pennsylvania, and in the Hocking Valley district in Ohio. The report for the year 1904 shows that the stock authorized is $32,000,000 preferred and $32,000,000 common. Of this, $29,423,700 preferred and $28,711,000 common stock has been issued; leaving $2,576,300 preferred and $3,288,900 common stock in the treasury. Other liabilities are $25,000,000 first-mortgage bonds, $1,933,653 bonds of subsidiary companies and $112,626 car-trust notes. The renewal fund amounts to $1,881,554.

The company owns a controlling interest in the Monongahela River Consolidated Coal & Coke Company, purchased in 1903. Liabilities on account of this interest are $3,000,000 notes issued for purchase of the stock; and $1,608,605 mortgages and collateral bonds. To offset this, the sum of $4,608,605 is deposited with the Union Trust Company, of Pittsburg, to relieve these obligations at maturity. The operations of the Monongahela River Company are not included in the statements given, but are reported separately.

The coal and coke statement is as follows, in short tons:

	1903	1904	Changes.
Pittsburg district	14,034,268	12,783,067	D. 1,251,201
Hocking district	1,480,350	1,349,428	D. 130,922
Total mined	15,514,618	14,132,495	D. 1,382,123
Coke made	149,842	206,005	I. 56,163

In 1902, the total coal mined was 14,908,351 tons. The causes of the decrease are explained below.

The income account for the year is stated as follows:

Net earnings, all expenses deducted	$4,261,511
Royalty allowance for depreciation	$603,940
Addition to renewal fund	79,889
Interest on first-mortgage bonds	1,250,000
Total charges	$1,933,829
Net balance for dividends	$2,327,682
Dividends on preferred stock	2,176,741
Undivided profits	$150,941

The undivided profits were appropriated for working capital. At the close of the year this account amounted to $3,887,725 in all. The net earnings, after deducting royalty allowance and renewal fund, were $3,577,682 for 1904, which compares with $6,751,025 in 1903; showing a decrease of $3,173,343. This was due to the depression in business and various unfavorable features in the coal trade.

The report of President Francis L. Robbins says:

"Notwithstanding a year of industrial depression such as we have just experienced which curtailed our tonnage and brought about a reduction in the selling price of coal and coke, your officers are able to report that during the year, after maintaining and improving the physical condition of the company's properties and after paying all fixed and other charges and dividends of $7 per share on the preferred stock, there has been added to surplus account $150,941. A considerable portion of the earnings were the direct result of economies in operation growing out of the policy of your management in the past, in building large power plants to furnish power for groups of mines and in introducing labor-saving machinery and devices, including electrical haulage in place of animals, wherever practicable. As in previous years, a charge has been made against operating expenses of 5c. for each ton of run-of-mine coal taken from the property—this is equivalent to about $400 per acre. The coal lands, as well as the other real estate, improvements and equipments of your company and its subsidiary companies, have always been and are still carried at cost. It is somewhat singular, perhaps, that in a year of industrial depression, such as we have just passed through, there should have been an unprecedented increase in values of coal lands in the Pittsburg district, and yet this is the case. The values of the company's lands to-day, measured by all recent purchases of lands in the district, represent an increase in the intrinsic value of your securities during the year 1904 several times greater than the earnings from operations.

"On Nov. 1 a contract was closed, with the approval of your directors, for the control and operation of the seven mines of the Pittsburg Terminal Railroad & Coal Company, now owned by the Wabash Railroad Company interests. By securing these mines a connection was made with the Wabash Railroad system, which through its controlled lines has just entered the Pittsburg district, and through which we will have another much needed means of transportation for our product.

"At the organization of your company it inherited an unwritten agreement, afterward embodied in five-year contracts, with two coal-and-ore handling companies operating on the Great Lakes, under which they have obtained large commissions on the sale of about 1,000,000 tons annually of Lake coal. These agreements were terminated by limitation at the close of Lake navigation for the year 1904, and were not renewed, because in the judgment of your officers and directors it will be more profitable to sell direct to consumers.

"Although during the year many blast furnaces and foundries were idle, greatly curtailing the consumption of coke, 400 ovens of the Colonial Coke Company, whose entire capital stock is owned by your company, were in almost continuous operation. This is one of the most complete and economical coke-making plants in the entire coke region, and its product is taking high rank in the market. As conditions may warrant, it will be the policy of the management to further increase the coke production by the building

of additional ovens, and in this way get a return on our large investment in coking coal lands.

"In previous annual reports references have been made to the inadequacy of railroad facilities for marketing the product of your mines and coke ovens, and the hope expressed that the expenditures then being made by the railroad companies would enable them to render more satisfactory service, but during the greater portion of the last half of the year, your operations were seriously interrupted by the lack of cars, or facilities for transporting those that were provided. To at least partially overcome this disadvantage your directors have authorized the purchase of 1,400 standard steel gondola cars, for which a satisfactory contract, on a ten-year car-trust plan, has been entered into, delivery of the cars to be made during the coming spring. With those now owned, the company's equipment will consist of 5,500 standard railway cars. The railroads in the Pittsburg district are also adding materially to their car and locomotive equipment, which gives encouragement for the proper handling of your large future production.

"The advantages of ownership and control of docks at all the principal points on the Great Lakes, and the strength of your company's organization in the northwestern territory supplied by lake shipments, have been more strikingly demonstrated in the year under review than ever before. It will be the policy of your officers to further extend and strengthen this important branch of the company's organization.

"Reference has been made in previous reports to the work of the Pittsburg Coal Company Employees' Association, which was organized four years ago for the purpose of helping the company's employees to help themselves along the most practical lines of profit sharing, insurance and pensions—the latter feature as yet affecting only mine operatives. Since the last annual report of your officers, 234 employees have completed their payments on contracts for the purchase of the company's preferred stock through the association, and have received their stock (2,460 shares), their participation in the association's earnings having cut down the cost of the stock to them to $41.36 per share. There are at this time 2,280 purchasers of preferred stock through contracts with the association, making monthly payments of $1 per share on 17,222 shares. During the year there has been distributed by the association for relief in cases of accident and death among the mine operatives $72,204, of which $13,056 was contributed by the company. The pension fund accumulation is $33,971, of which $14,130 has been contributed by the company. In addition the general expenses of the association have been paid by the company. These figures, however, cannot give an adequate idea of the great good that has been accomplished by the Employees' Association. It has not only brought relief to hundreds of employees' families in need of help, but it has inculcated in many others habits of thrift which lead to improved conditions and instill hope for the future. A fine spirit of confidence in the company and loyalty to its interests have been awakened, the value of which cannot be measured; these must, however, be great factors in the future success of the company. It will be the policy of the management to foster and encourage the work of the association in every practical way.

"The adjustment of the wage scale in the early part of 1904 for two years ending April 1, 1906, insures a satisfactory basis of wages between the company and its employees for another year.

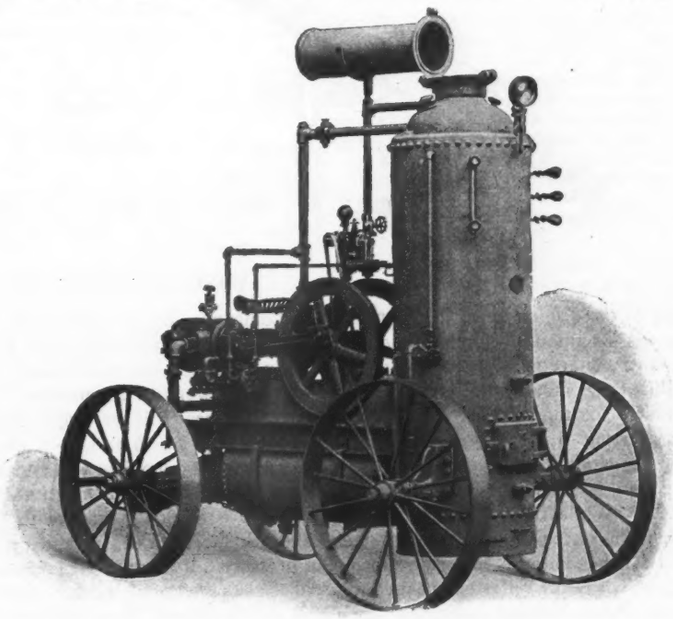
"During the past summer and fall the coal lands and mining plants of your company were inspected and appraised by the eminent geologist and mining engineer, Mr. Edward V. d'Invilliers, of Philadelphia, in which work he had the assistance of Messrs. F. Z. Shellenberg and George S. Baton, of Pittsburg, and other mining and mechanical engineers. During the same time also, the company's docks, railroads and railroad cars were inspected and appraised by the well-known railway expert, Mr. Emerson W. Judd, of New York City, assisted by J. H. Thompson, consulting engineer, also of New York City."

Extracts from the reports made by these gentlemen are given with the company's statement.

In the earth's atmosphere, a high barometer is the indication of descending currents which generate heat by compression and prevent cloud formation.

A Portable Air-Compressor.

There is a demand in many industries for a portable air-compressing outfit which can easily be carried from one location to another and used for the operation of drills, chipping and riveting tools, sand-blasting and similar purposes. Such a machine would be useful in many mine operations. The outfit illustrated herewith has been designed by the Clayton Air Compressor Works, of New York. It is entirely self-contained, as the boiler, compressed-air receiver, air-compressor, and circulating-pump for cooling the air-cylinder jackets are all mounted on one truck. For riveting-hammers the compressor is proportioned to deliver air at about 100 lb. pressure per square inch,



PORTABLE BOILER AND AIR-COMPRESSOR.

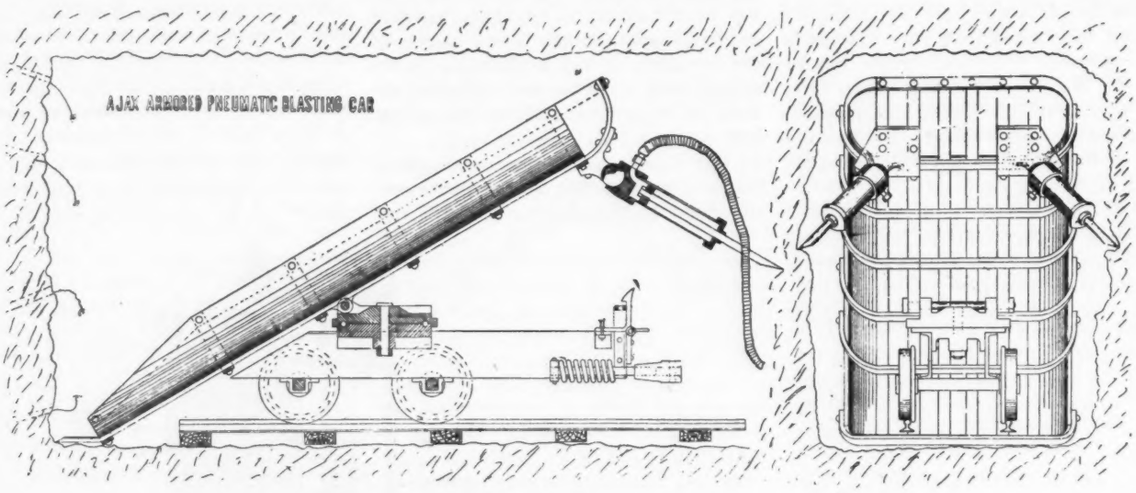
while for sand-blast and stone tools, air is supplied at 70 lb. pressure. The receiver permits the storing of air so that a much larger number of tools may be operated than otherwise, since it is only occasionally that all tools are in operation at the same time. The pressure of the air is maintained by a pressure governor, while the compressor is prevented from running away, in case of a break on the air line, by a fly-ball speed governor, the two governors being so combined that they operate upon a common throttle-valve. The compressor engine exhausts into the stack, thus increasing the draft. The air-compressor cylinder walls are jacketed and are supplied with cooling water by a small duplex pump.

The stars usually show no perceptible diameter; but the one called DM. + 30.3639° is actually surrounded with a spherical atmosphere of hydrogen some 5 seconds of arc in diameter.

The Latest Lake Ore Carriers.

Four steamers are now being built by the American Ship-building Company for the Pittsburg Steamship Company, which conducts the Lake carrying branch of the United States Steel Corporation's business. These steamers, according to the Cleveland *Marine Review,* offer further testimony to the originality of design now marking the evolution of ship building on the lakes. They are in a number of features unlike any ships built or building. In the first place they are the longest on the lakes, being 9 ft. longer than the steamer *Augustus B. Wolvin,* or 569 ft. over all, 549 ft. keel, 56 ft. beam, and 31 ft. deep. While the general principle of construction is the same as their predecessors in the absence of stanchions and stringers or any interference below deck with the unloading machines, the vessels are not of arch construction. Mr. Coulby, after consulting a number of authorities, concluded that an arch was primarily intended to support weight from the top and that a more rigid longitudinal construction could be secured by a straight girder across the deck. The construction of the cargo-hold also is a departure from anything at present on the lakes. It might be said to be a compromise between the *Wolvin* and the later Tomlinson boats. The cargo-hold descends in a straight line from the deck until within 9 ft. of the tank top, where an inner hold or hopper is constructed 9 ft. from the skin of the ship and descending to the tank top. The top of the hopper is joined to the skin of the ship by an incline construction, thus avoiding what would otherwise constitute a shelf and also preventing any lodgement of ore. The water bottom is 5 ft. 6 in. deep and is used for water ballast in conjunction with a 9-ft. space formed by the hopper and the sides of the ship. This construction gives enormous water ballast capacity, approximating 8,500 tons, making the steamer navigable in all sorts of weather and providing extraordinary rigidity in the longitudinal section. The steamers will have 34 hatches spaced 12-ft. centers, with no bulkheads whatever in the hold, and will have a carrying capacity of 10,000 gross tons of ore. The hatch covers will be operated by the Brousseau device, which is controlled by the American Ship-building Company. By this device all hatches may be opened and closed from a central station, and it is estimated that two men can do the work in 20 minutes.

The engines will be triple-expansion, with cylinders 24, 39 and 65-in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers 15 ft. 4½ in. diameter by 11 ft. 6 in. long, fitted with Ellis & Eaves' induced draft, and allowed 170 lb. pressure. In auxiliary equipment they will be more complete than any vessel now on the lakes. They will have Globe windlasses and capstan and Globe steering and mooring engines.



ARMORED BLASTING CAR.

Ajax Blasting Car.

The accompanying cut illustrates a new style of car, designed and made by T. H. Proske, of Denver, Colo. It is intended to expedite the removal of the muck broken down by a round of shots in the heading of a tunnel; if it does this, the most prolific source of delay in tunnel driving will be circumvented.

The long, low car is of the most substantial construction, steel boiler plate being used throughout, strongly reinforced by steel ribs. In action, the car is brought to the face and is tilted forward by placing the pneumatic props under the rear end and admitting compressed air from the drill supply pipes. If desired for safety, the wheel truck may be disconnected and withdrawn, although the air-cylinders cushion the shock so that no breakage can result. As the car bottom presents a sloping surface to the flying rock, and as rarely more than one shot goes off at a time, and then exerts most of its energy in breaking the ground, damage to the car body is slight.

A car will ordinarily catch only about three-quarters of the muck, as it cannot be made to fit the tunnel closely and as the shot-firer needs space to escape. If an undue proportion of the débris should fall on to the front or nearer end of the car, making it difficult to restore the horizontal position of the body, the rear props may be braced against the roof and air admitted, thus bringing the load to bear on the truck. In a double-track heading two cars may be placed side by side, with their intervening space covered.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending February 7, 1905.

781,678. AIR-COMPRESSING MACHINE.—Clarence H. Richwood, Boston, Mass. In an air-compressing machine, in combination, a central body or support having a plurality of axially radial casings therearound, having valved air-inlet, and valved air-outlet openings thereto and therefrom, a reservoir, and conduits connecting the same with the air-outlets, flexible diaphragms in said cases, and rods connected respectively thereto, having guide-bearings for rectilinear movements through bearings therefor which are supported by the central body, a driving-shaft having a crank mounted for rotation in the central body, pitman-rods severally connected with the crank and with the respective diaphragm-rods, and means for rotating said shaft.

781,688. ELECTRIC INGOT-EXTRACTOR.—James R. Speer and Willie H. Baltzell, Pittsburg, Pa. In an ingot-stripper, a traveling crane, a screw-threaded mechanism carried thereon, means on the crane for rotating the screw-threaded mechanism, said means being arranged in such a manner as to cause, by the

rotation of said screw-threaded mechanism, relative longitudinal movement of the mold and ingot and means for maintaining the rotating means in operative relation to the screw-threaded mechanism during the working movements of the latter.

781,689. APPARATUS FOR MAKING BISULPHITE.—George A. Stebbins, Watertown, N. Y. In a bisulphite apparatus, the combination of a hollow member provided with baffle-plates, stirrers disposed adjacent to said baffle-plates and movable relatively thereto, means for supplying a liquor into said hollow member and mechanism for discharging gases in the form of a sheet of minute bubbles, at a point comparatively near the bottom thereof and below the level of the liquid therein contained.

781,708. INGOT-STRIPPER.—Willie H. Baltzell, Pittsburg, Pa. In an ingot-stripper, a mold-engaging device, a carrier therefor, an ingot-stop, a carrier therefor, sheaves supported by the carriers, a flexible device on the sheaves, and means for operating the flexible device.

781,711. PROCESS OF TREATING PRECIOUS METAL-BEARING ORES.—Alden H. Brown, Boulder, Col. A process for the treatment of ore consisting in first pulverizing the ore in the presence of cyanide solution; second, subjecting the ore to hydraulic classification by the introduction of cyanide solution at the bottom of an overflow-tank to produce an ascending current; third, leaching the ore by the use of cyanide solution whereby the finer values of the ore are dissolved; fourth, removing the dissolved metallic values from the ore in any suitable manner; and finally subjecting the residue of ore to concentration.

781,726. CONCRETE-MIXER.—William J. Judd, New York, N. Y., assignor to Frederick C. Austin, Chicago, Ill. In a machine for mixing concrete and the like, a rotary, polyhedric mixing-box arranged to revolve about a tilting axis passing through diagonally opposite vertices, the box being closed at one of such vertices and having its diagonally opposite vertex portion removed to an extent to provide a charging and discharge opening in alignment with said axis of rotation; and a hopper for feeding materials that are to be mixed into the box by way of its charging and discharge opening; the box being supported to tilt its axis or rotation in a direction to bring its charging and discharge opening into position to receive from the hopper, and in alternation therewith to depress such charging and discharge opening into position to permit the rotary action of the box to eject therefrom the mixed-up batch.

781,738. EXCAVATING-MACHINE.—Newton D. Petrie, Celina, Ohio. A turn-table supporting the dredging mechanism, a pair of cylinders, a connection between the piston-rods of the cylinders and the turn-table, and means for supplying water under pressure to either of the cylinders to the exclusion of the other, thus to effect rotation of the turn-table.

781,742. TUBE-MAKING MACHINE OR PRESS.—Hermann Romünder, Milwaukee, Wis. A tube-making press, composed of a suitable frame, an expansible and collapsible inner block or core, consisting of a number of sectors, separably held together, a vertically reciprocating piston and a number of horizontally reciprocating pistons, all suitably mounted on and supported by said frame, a number of press-plates suitably secured to said sectors and said pistons, means whereby the said core may be expanded and collapsed and means whereby the said press-plates may be heated.

781,747. METHOD OF AND APPARATUS FOR CALCINING PLASTER.—Frank A. Simonds, Grand Rapids, Mich., assignor of one-half to Adolph Leitelt Iron Works, Grand Rapids, Mich. A method of calcining plaster, consisting of applying steam heat to a continuously moving stream of plaster, and regulating the temperature of the steam to substantially the calicining temperature of the plaster by regulating the pressure of the steam.

781,748. DISINTEGRATING-MACHINE.—Arthur W. Smith, Barking, England. In combination, a casing of elliptical form, an impact-block therein, a shaft, beaters on the shaft, and an inlet-opening for the material arranged in the side wall of the casing to permit the inlet of the material in a direction substantially longitudinally of the axis of rotation of the beaters, said beater-shaft being mounted to rotate in one focus of the elliptical casing and the said impact-block extending substantially along the major axis of the casing to the other focus.

781,749. INSTRUMENT FOR SQUARING STONE, ETC. Fred T. Stevens, Bryant Pond, Me. An instrument, consisting of an elongated base, a segment secured thereto and extending vertically upward therefrom, said segment being provided with a curved slot through the body thereof parallel with the curvature of the segment, an arm pivotally secured near the apex of the segment provided with a head having recesses or depressions at right angles to each other, one upon the outer face of the end and one upon the top face of the end, a horizontal spirit-level mounted in the depression upon the top face of the end, and a vertical spirit-level mounted in the other depression.

781,760. APPARATUS FOR ROLLING BARS FROM COILS.—John Bergmann, Pittsburg, Pa. In apparatus for rerolling coiled springs, the combination of rolls and housings therefor, and a spring-support arranged to hold the coiled spring so that it can rotate, said spring-support being located at one side of the plane in which the axes of the rolls lie and being movable toward and from said plane.

781,787. APPARATUS FOR RECOVERING MINERALS.—Francis S. Prouty, San Francisco, Cal. An apparatus for collecting minerals comprising a chute, a power-wheel mounted therein, a griddle at the head of the chute, the lower end of the chute being provided with a downwardly projecting section, an endless traveling belt of fibrous material to which the chute leads, and a rigid platform over which the upper moving portion of the belt passes, the said platform being adapted to receive the initial force of the material falling from the downwardly extending section of the chute.

781,807. PROCESS OF SMELTING NATIVE-COPPER-BEARING ROCK.—Franklin R. Carpenter, Denver, Col. A process of smelting native-copper-bearing rock which consists in smelting the same with a flux and sulphur.

781,808. PROCESS OF REDUCING VANADIUM.—Franklin R. Carpenter, Denver, Col. A process of extracting vanadium from silicious ores containing it, which consists in subjecting a furnace charge comprising the silicious ore of vanadium, a compound of a carrying metal with which vanadium will alloy, a basic flux and fuel, to an air-blast, the fuel and blast being proportioned to each other and to the other ingredients of the charge, to maintain a high temperature and reducing action, thereby causing a reduction of the vanadium and the carrying metal and the alloying of the two, and a union of the basic flux and the silica to form a slag.

781,824. ROTARY ORE-ROASTING FURNACE.—Ferdinand Heberlein, London, and Woldemar Hommel, Lee, England. A rotary muffle-furnace for roasting ores or the like, comprising an ore-chamber the floor of which rotates, a heating-chamber immediately beneath, rotating with the floor of the ore-chamber, and a stationary heating-chamber immediately above the ore-chamber; the heating-gases being caused to circulate first through the lower heating-chamber and subsequently through the upper one

781,826. PROCESS OF MAKING NITRIC ACID.—Henry W. Hemingway, Walthamstow, England. A process for the regular generation of nitrous fumes, consisting in first mixing together a suitable nitrate and acid, raising the mixture to the required temperature and then gradually adding a ferrous salt.

781,834. METALLURGICAL FURNACE.—Richard L. Lloyd and Peter Thill, Great Falls, Mont. In a metallurgical furnace, a stationary longitudinally curved hearth for the ore, in combination with an ore-feeding mechanism disposed in the space between the turns of the hearth.

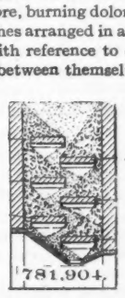
781,836. APPARATUS FOR MANUFACTURING GAS.—Leon P. Lowe, San Francisco, Cal. The combination of the two shells, each having a mediate chamber, and also having a common terminal combustion-chamber connecting the two shells, loosely piled refractory material in each shell above and below said mediate chamber, a steam-supply pipe, an air-inlet pipe, and a flue at the end of each shell opposite to the common combustion-chamber, a fluid-hydrocarbon pipe and a gas-outlet pipe opening into each of said mediate chambers, and suitable valves for controlling said pipes.

781,837. APPARATUS FOR MANUFACTURING GAS AND RECOVERING BY-PRODUCTS.—Leon P. Lowe, San Francisco, Cal. In an apparatus for manufacturing gas, and recovering by-products, the combination of two chambers, a gas-conduit connecting said chambers, a condenser interposed in said conduit, means for feeding into the first chamber fluid hydrocarbon, means for supplying steam into the second chamber, means for heating said chambers, and means for drawing off the finished gas.

781,838. APPARATUS FOR CLEANING GASES.—Leon P. Lowe, San Francisco, Cal. In an apparatus for cleaning manufactured gases, the combination of a chamber, means for admitting gas and steam into said chamber and for rotating said gas and steam therein and means for condensing said steam.

781,843. BLACKSMITH'S FORGE.—Albert W. McCaslin, Pittsburg, Pa. In a blacksmith or like forge, the combination with the shop-floor having a fuel-pit formed therein, of a box-like frame located over said fuel-pit, converging side plates supported by said frame, a hearth carried by said plates, said frame having an opening leading to said fuel-pit, and said fuel-pit having a sloping wall extending down thereto.

781,904. FURNACE OR KILN FOR ROASTING ORES.—Gustaf O. Petersson, Dalsbruk, Russia. An improved furnace or kiln for roasting finely crushed ore, burning dolomite, etc., provided with flat arches arranged in a shaft at different levels zigzag with reference to one another, and having a space between themselves and the walls



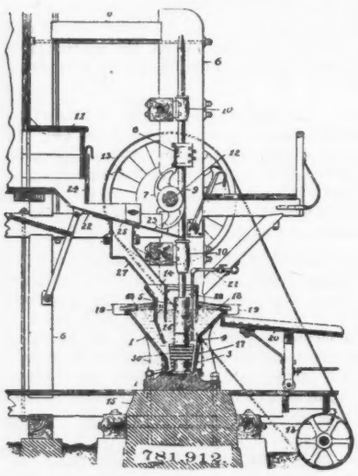
of the shaft and with the space beneath the bottom arch, or arches communicating at one end with the outer air and at the other end with a fire-chamber, which in its turn communicates with one end of the space beneath the arch or arches above, while the other end of the latter space is in communication with a chamber, in its turn communicating with the space beneath the top arch or arches, said space last mentioned communicating with a chimney either directly or through the aid of other arches, compelling the gases to flow repeatedly back and forth in the furnace or kiln.

781,867. APPARATUS FOR NICKEL-PLATING.—Jonas W. Aylsworth, East Orange, N. J., assignor to Edison Storage Battery Company, Orange, N. J. In apparatus for continuously electroplating a continuous strip-like article or a

connected series of separate articles, the combination, with a heating-chamber through which the article or articles pass continuously and means for heating the article or articles in said chamber in the presence of a reducing atmosphere so as to deoxidize the article or articles, of a plating-bath and means for passing the article or articles continuously through said bath and for continuously plating a metal thereon in such transit.

781,887. APPARATUS FOR THE REMOVAL AND UTILIZATION OF SLAG.—Thomas C. King, Marion, Ala., assignor of six-tenths to James W. McClure, Pittsburg, Pa. In an apparatus of the class described, the combination with the cinder-runs of a furnace or other source of molten-slag supply, of a slag-pit having a covered top with a steam-outlet therein and means to govern it, means to supply water to the pit at or about the point where the molten slag enters the pit, a water-overflow therein, a series of piping arranged within the upper portion of the pit, with inlet and outlet tubular connections leading to the exterior of the pit; and means to discharge the granulated slag from the pit.

781,912. STAMP-MILL.—Robert Schorr, San Francisco Cal. In a stamp-mill for crushing ore, a mortar, with outwardly-flaring sides, a die



in the bottom thereof, a dropping stamp therein, means for supplying water thereto, screens at the top of the mortar extending inwardly from the top of the flaring edge, and means for conveying away the water and suspended material passed through the screens by the action of the stamp.

781,934. MACHINE FOR CUTTING CLAY PRODUCTS.—Christian A. Christiansen, Perth Amboy, N. J., assignor to himself and William James Lyle, South River, N. J. A machine for cutting clay products comprising a base, a table slidable thereon and having transverse cutting means, and a table also slidable on said base and having a tiltable top, and automatically operated means for locking and unlocking said tables.

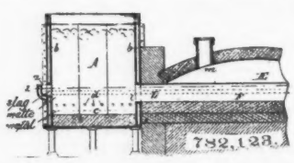
781,979. DUMPING-CAR.—Newton Wilcoxon, Chicago, Ill. In a dumping-receptacle comprising a tilting body and a pivotally supported side-board, the combination with a tongue depending from the lower edge of the side-board, a keeper secured to the body in alignment with said tongue, and means pivoted in the path of movement of said tongue for guiding the same into the keeper when the body is swung into a closed position.

782,078. ORE-CONCENTRATOR.—Albert H. Stebbins, Little Rock, Ark. In a concentrator, the combination of a frame, a concentrating-surface supported by said frame, a series of concentrate-guides disposed diagonally over the concentrate-surface, a series of tailing-guides disposed above the concentrate-guides, said concentrate and tailing guides being arranged at an angle to each other, the concentrating-surface being formed of sheet material having perforations therein, the walls of which are offset to direct fluid-currents over or substantially parallel to the said surface.

782,082. ROTARY PUDDLING OR BUSHELING FURNACE.—William Stubblebine, Bethlehem, Pa. A rotary puddling, busheling or scrapping furnace having a treating vessel mounted so as to rotate about its longitudinal axis, said axis being inclined in respect to the horizontal, and said vessel having a gas-inlet at one end and a gas-outlet at the other, the gas-inlet being uppermost and being of greater area than the gas-outlet

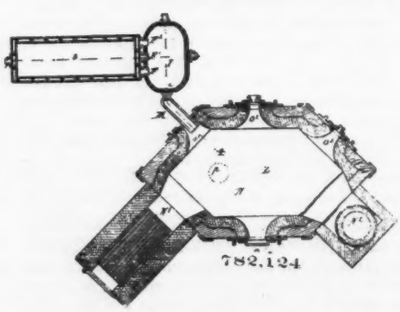
782,103. WELL-DRILLING MACHINE.—William L. Bruner, Shelton, Neb. In a well-drilling machine the combination of a frame having side and cross bars, a windlass journaled in the side bars, a swing-pulley having a shank, a pivot-pin connecting the shank with one of the cross-bars, brackets on the side bars, a traveler-rod held immovably in the bracket, said rod being bent on the arc of a circle with the pivot-pin as its center, a sheave longitudinally movable on the traveler-rod, and a flexible element passing around the windlass, sheave and swing-pulley, whereby the peripheries of the sheave and swing-pulley are maintained constantly in alignment with the pivot-pin.

782,123. METHOD OF MATTE OR PYRITIC SMELTING.—Oliver S. Garretson, Buffalo, N. Y., assignor to Garretson Furnace Company, Pittsburg Pa. A method of matter or pyritic smelting which consists in bessemerizing or con-



verting matte by a blast underneath a column of material containing flux, maintaining a flow of the resulting slag to a forehearth, supplying sulphur-bearing material to the slag in the forehearth, while maintaining the slag in a freely flowing condition, thereby producing a low-grade matte which combines with metal or matte contained in the slag, and maintaining a flow of such low-grade matte back to the bessemerizing or converting region.

782,124. METHOD OF CONVERTING MATTE.—Oliver S. Garretson, Buffalo, N. Y., assignor to



Garretson Furnace Company, Pittsburg, Pa. A method of converting matte which consists in converting matte by a blast underneath a column of material containing a flux, removing the slag, allowing the matte accompanying the slag to settle, removing the superincumbent slag, practically free from matte, exposing the slag to heat which sweeps over the surface of the slag and keeps the slag in a freely flowing condition, and intermittently adding sulphur-bearing material to the slag for producing a low-grade matte which combines with any values contained in the slag.

782,145. PROCESS OF PRODUCING PURE COPPER.—Louis M. Lafontaine, Paris, France. A process for producing pure copper, which consists in forming the copper-producing ores into suitable plates for anodes without previously treating the ores, and subjecting said plates to an electrolytic bath whereby an electric current causes dissolution of the copper in said plates and transfers it to the cathodes of the cell.

782,148. ARTIFICIAL FUEL.—Anton P. Lepu, Greensburg, Kan. An artificial fuel consisting of coal-dust or refuse, earth, chloride of sodium, and sodium hydrate, in the proportion to the ton of 200 lb. of chloride of sodium, 200 oz. of sodium hydrate, one-half the remainder in coal-dust or refuse and the other half of the remainder in earth.

782,196. CRUSHING OR PULVERIZING MILL.—Edwin C. Griffin, West Newton, Mass., assignor to Peter B. Bradley, Brookline, Mass., and Robert S. Bradley, Boston, Mass. In a pulverizing-mill, a rotatable ring or die, two crushing-rolls rotatably mounted on fixed axes within said ring and upon which rolls the ring or die is rotatably supported, and means to positively impart to the ring or die a speed sufficient to cause the material to be held against the inner surface of the said ring or die by centrifugal force.

782,207. RETORT.—John L. Jackson, Saginaw, Mich., assignor to American Sandstone Brick Machinery Company, Saginaw, Mich. In combination with an arched retort, composed of sections and suitable fastening devices for the sections projecting within the retort beyond its inner surface, of a drip-conveyer within said retort, comprising a trough curved longitudinally to conform to the internal configuration of the arch, said trough being attached to said retort by bolts passing therethrough, and having their heads flush with the convex side of said trough.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week ending January 21, 1905.

28,602 of 1903. BASIC FURNACE LININGS.—H. Fas, Paris, France. Improved kiln for use in making basic linings for metallurgical furnaces.

28,736 of 1903. NICKEL STEEL.—T. H. Gannon and W. H. Phillips, Oldham. The use of a soluble nickel salt, such as nickel ammonia sulphate, for toughening steel.

4,058 and 4,059 of 1904. ELECTRIC FURNACE FOR ZINC SULPHIDES.—W. and H. Simm, R. Storey and J. S. Pellers, Liverpool. An electric furnace and process for volatilizing zinc sulphide, and burning it to zinc oxide and sulphurous acid, and the utilization of these products.

4,295 of 1904. ZINC SULPHIDE MAKING.—E. Marlier, Brussels, Belgium. Production of a sulphide of zinc of a lighter nature and more easily ground to fine powder than the form usually known.

6,551 of 1904. BALL MILL.—H. Lohnert, Bromberg, Germany. Improved method of holding in place the linings of ball mills, so as to prevent the breaking of the screws and bolts.

9,037 of 1904. SAFETY CAGE FOR MINE HOISTS.—A. Hanley, Bristol. Improved safety apparatus for mine cages, for gripping the guide ropes.

13,892 of 1904. REMOVING MOISTURE FROM BLAST.—J. Gayley, New York. Refrigerating apparatus for removing moisture from air before use as blast in smelting furnaces.

23,380 of 1904. TREATING NICKEL ORES.—Société Electro-Metallurgique Francaise, Froges, France. Treating nickel ores free from sulphur in an electric furnace, and so obtaining an alloy of nickel cobalt and iron that can be used in the manufacture of nickel steel.

Special Correspondence.

San Francisco. Feb. 14.

The desert region of southwestern Nevada and southeastern California is in these days attracting more attention from prospectors than any other portion of these States. There is very little water and scarcely any timber, and lack of transportation facilities, combined with these drawbacks, has prevented much systematic work. The discoveries at Tonopah, Goldfield and Bullfrog districts, Nevada, have attracted many prospectors and miners to those localities, and much prospecting is now going on on both sides of the boundary line. The Panamint range of mountains, in the eastern part of Inyo county, California, forming the western boundary of Death valley, is one of the new sections about to be opened up. Finds have been made 35 miles east of Keeler, and about the same distance southwesterly of Bullfrog, Nev. Several ledges from three to six feet in width were discovered in December last, and some good gold ore has been opened up. A district has been formed called Gold Belt, and A. V. Carpenter has been chosen recorder. There is a good wagon road within six miles of the camp. Both water and timber are said to be obtainable within a reasonable distance. An old district about to be revived is that of Gold Park, in Riverside county, near the San Bernardino county line, twenty-eight miles north of Indio, and nearly due south of Goldfield and Tonopah, and of the Bagdad mines, in San Bernardino. The district was originally discovered as far back as 1879, and a few arastras put up, but no mills were erected. None of the older shafts were sunk deeper than 200 ft. A company has now been organized called the Gold Park Consolidated to operate 52 of these old claims. This company is planning to bring in water in pipes a distance of seven miles, and to erect a mill. J. N. White is superintendent, and the president is W. E. Winnie, of Los Angeles.

Alpine is one of the counties of California where the mining industry has been greatly neglected. While there are heavy falls of snow on the summit of the Sierras in the Sierra portion of the county, this is not the case throughout the county. Years ago attempts were made to work the gold ores, but they were considered "base," and the mines were eventually abandoned; but in those days they did not know so much about working gold ores as is known at present. Within a few years two mills, one of 16 and the other of 20 stamps, have been built at Loope, and several mines are being successfully worked and are producing. No difficulty is now found in reducing the ores. Both water and electrical power are available to drive the machinery. There are also numerous prospects on the mineral belt which courses with the Sierra range on their eastern base in the foothill ranges. Developments have shown some high-grade ore, and also numerous bodies of low-grade ore carrying gold and copper or gold and silver. Many of these are still undeveloped, and there is plenty of chance of favorable investment in this class of claims.

It is worthy to note that there is at present a very marked interest in the mining and quarrying of structural material in California. These include brick and pottery clays, cement, glass sand, granite, lime and limestone, macadam and rubble, marble, basalt paving blocks, sandstone, serpentine, slate, soapstone, etc. The value of these products was in 1903 nearly $3,000,000 more than in the previous year. The figures of 1904 will show a material increase over that sum. Brickyards and potteries are increasing rapidly in number, and the latter are making much terra cotta, tiling, sewer-pipe, etc. The granite quarries worked are no longer confined to a few localities, but many are being opened at new points. Limestone is being quarried and lime burned in many counties of the State. The building of new roads and renewal of old ones keeps many of the macadam quarries busy, and harbor improvements, sea walls and railroad construction demand hundreds of thousands of tons of rubble-granite, limestone and sandstone. About a dozen new marble quarries were opened in the State last year. Granite paving blocks are not so much in demand as before asphalt and bituminous rock pavements became common, but a number of quarries are still operated. The slate quarries are doing a large business and extending their operations. The cement factories, three of them quite large, have been about doubling their output of late. More sandstone quarries are being operated, as extensive building operations create a demand for the product.

Denver. Feb. 17.

A notable event in mining circles is the gift of $50,000 by Mr. Simon Guggenheim for the erection of a general building, containing the executive offices, an auditorium, rooms for the exhibition of ores and the library at the State School of Mines. This is the largest gift ever made to a State institution. Plans for the new building, which will probably be named Guggenheim Hall, will be drawn at once. It will fill a long-felt want, as the institution has for several years past been badly crowded for room.

The amount awarded to the Morning Glory Mining Co. in its suit against the Mary McKinney company, in the Cripple Creek district, has been placed at $242,113. In the report of the referees they state that the gross value of the ore taken from the ground in dispute is $289,140, a tonnage of 14,871.5. The waste tonnage was 8,279.5, leaving 6,592 tons shipped, of which the gross value was $186,894. The balance was made up by values taken out by lessees of the defendant company.

At the instance of the superintendent of the mineral department of the State land board, a citation has been issued to the Victor Fuel Co. and the Colorado Fuel & Iron Co., to appear before the board and show cause why some leases on State coal lands in Huerfano county should not be cancelled, on account of these companies not operating their leases according to law and to their contracts with the State.

The Stratton's Independence Co. has renewed 35 leases on its properties for six months. This includes nearly the whole number in force.

The Colorado, Columbus & Mexican Railroad Co. has been incorporated in New Mexico, to build a line from Salt Lake City to Monterey, Mexico. It has a capital of $5,000,000. The directors are: J. G. Hilzinger, of El Paso, Texas; Osman Bailey, of Columbus, N. M.; W. R. Merrill, A. J. Clark and B. Y. McKeyes, of Deming, N. M.

The first annual meeting of the stockholders of the American Zinc & Chemical Co., which operates a plant near this city, under the management of C. E. Dewey, has been held. The stock is owned to a large extent in Pittsburg, Pa., and a number of gentlemen from that city attended the meeting. The following officers were elected: Walter Lyon, Pittsburg, president; C. E. Dewey, Denver, vice-president; J. T. Keil, Pittsburg, treasurer, and F. J. Shaler, Pittsburg, secretary.

Scranton. Feb. 20.

Inspector Preytherch, of the third anthracite district, in his report, lays particular emphasis upon the number of fatal and non-fatal accidents that have occurred in his bailiwick, owing, he observes, to the neglect of miners to pay proper attention to the roof of the chambers in which they are employed. This disregard of the miners for their own safety and that of their laborers has been pointed out by the other inspectors and by Chief Roderick, of the Bureau of Mines, as the principal cause of fatal mine accidents. During the year there were 30 mines in operation in Mr. Preytherch's district, the output being 4,380,324 tons, with 36 fatal and 84 non-fatal accidents. The production of coal was as follows:

D. L. & W. RR.	1,942,159
Scranton Coal Co.	1,012,116
Delaware and Hudson Co.	496,140
People's Coal Co.	385,951
Penn. Coal Co.	202,059
Green Ridge Coal Co.	140,803
A. D. & F. M. Spencer	64,680
Economy Light, Heat & Power Co	51,583
Nay Aug. Coal Co	48,330
Bull's Head Coal Co.	18,893
J. J. Gibbons.	11,040
Mountain Lake Coal Co.	[3,540
Total.	4,380,324

The Lackawanna company is erecting a new breaker at its old Dundee shaft, at Hanover. It is also sinking the deepest shaft in the anthracite coal regions, at Ormond. The company is also installing a new electrical plant at Plymouth, which will be equipped with Curtis turbines and all the latest electrical improvements in coal mining. The company has already installed the Curtis turbines at its Hanover electrical power plant at Avondale. The Plymouth station will supply power to the Auchincloss, Bliss and Truesdale mines. A turbine condensing plant will also be installed here. This will be the most modern electrical plant in the anthracite coal regions.

The Diamond breaker, which was erected in 1854, will be torn down and a new one erected. The new breaker will have a capacity of 2,000 tons daily, and, like all recently erected breakers, will be equipped by electricity.

During the unusually cold weather the moving of coal trains has been rendered very difficult, and it has been almost impossible in some breakers to operate the machinery.

The operators in the lower Schuylkill regions have made extensive preparations to prevent the mines on the lower grounds being flooded after the thaw sets in. During the past few winters flooded mines have caused enormous damage in low-lying mines.

The Lackawanna's huge pumping station at the Central mine, which has taken two years to erect, will be opened about April 1. This is not only the largest pumping station in the anthracite region, but perhaps in any coal field in the world. Hitherto each mine had its own pumping station, worked by an independent staff

of pump runners. This was not a very satisfactory arrangement; but, up to the present, engineering experience provided no better. The new pumping station will drain all the mines in what is locally known as the Keyser valley, including seven or eight large mines. All the water from these mines will be collected and disposed of at a single point. The machinery is, as far as possible, automatic; two men will probably be sufficient to superintend its operations. The new pumping station will be manipulated by electricity.

Duluth. Feb. 19.

The Oliver Iron Mining Co. is erecting a number of buildings at the Moore mine, Cascade range, and will make that property a larger shipper this year than it ever has been. All Moore ore goes to the Escanaba crushers, and the mine will be worked by steam shovel. At its Section 16 mine, Ishpeming, the company will put in new model machinery in the spring. It is building a number of structures at its old range mines, and putting them all in the pink of condition for a large and economical output.

Corrigan, McKinney & Co. are doing a great deal of work at all their mines, Mesabi and Menominee ranges. On the former they will open a new mine to be called the St. Paul, west of their Stevenson, and their three opened properties, Stevenson, Jordan and Commodore, will all be as large shippers as possible. Stevenson has been extensively stripped since last fall, Jordan has been stripping during the winter by milling the overburden down and hoisting it through shaft, and Commodore is being overhauled for mining. It has been idle and full of water for some years, and was found in pretty bad shape. On the Menominee range they have so far proceeded with unwatering Dunn that a 1,200-gallon Prescott pump is now being placed at the botom of the main shaft. There is a large open pit at this mine, and a diamond drill hole is now being driven from the shaft to this pit, that the water therein may be drained to the sump, and pumped by the machine now going in. Cole & McDonald, of Duluth, are boring the tap holes. These will permit the water to come away just as fast as the pumps can handle it. These holes will be flat, and the collar of each is firmly secured to a valved casing, set in concrete. Because of the fact that the main body of water is above the bottom of the new shaft, which is 700 feet deep, an attempt at blowing out the water by hydrostatic pressure will be made. It is expected that most of the water to be tapped can be thus blown out of the mine. A 1,200-gallon pump has also been ordered for Lamont mine of the same concern. The mine is now dry and a large force is getting ready to hoist ore. Crushers have been ordered for both Dunn and Lamont, to be installed by spring. At Great Western the water is below the seventh level, and main pumps have been started on the sixth. The water is now going down at the rate of three to four feet a day.

Quite a land boom has developed in the Cuygona district, and west of there as far as Brainerd, Minn., and tracts of farm land and swamp are being taken under option or purchased at far above their actual value, unless iron ore is found. The boom is wild, as there are no surface indications, and the work so far done there does not show very much good ore. Messrs. Agnew, Washburn, Alworth and W. H. Cole, of Duluth, are drilling there and have sunk several holes, in one of which they found some 50 to 52% ore. They have been successful Mesabi range operators.

Machinery for the old Kloman mine, recently taken by the Flagler Iron & Steel Co., is under way at the shops, and will be set up as soon as built. The mine is being explored to see if it actually does contain any ore, as asserted by the Flagler company, and as denied by many mining men of the Lake Superior region. If the mine proves of value it will be a surprise to the fraternity around the Marquette range, who know its previous career and of the explorations that have been conducted there in the past.

Salt Lake City. Feb. 17.

It is expected that the mill at the Columbus Consolidated mine in Little Cottonwood district will soon resume operations. The water supply is normal again.

The second blast furnace of the United States Mining Co.'s lead smelter was placed in commission this week and the first shipment of lead bullion made. The company had acquired an iron property near Richfield from which it will draw an ideal fluxing material. The final details in connection with the deal were concluded this week.

The late storms have delayed the completion of the Continental Alta aerial tramway, which is to be operated between the Continental Alta mines at Alta and the mill five miles below. The management expects, however, to have the line complete by March 1, at the latest.

The Boston Consolidated is shipping again after a brief cessation and has begun to deliver the smelters 200 tons of ore per day. In the meantime, the development of the copper bearing porphyries is progressing preparatory to the erection of the 1,000-ton concentrating mill, the announcement of which was made by Samuel Newhouse about a week ago. A tunnel is being driven into the porphyries, and has been completed for about 120 ft. This ore is of the same character and contains the uniform values found in the ores mined in the domains of the Utah Copper Company.

The Abe Lincoln mine at Pioche, Nevada, has been bonded to A. W. Scott, of Salt Lake, and Charles S. Miller, of Boston. A campaign of exploration has already been inaugurated, and it is the intention to install cyanide equipment. The E. & F. mine is also reported to be under bond to an Eastern syndicate. The Snowflake and Horseshoe properties at Fay, Nevada, are also likely to change hands.

The Pittsburg-Salt Lake Oil Co., of which A. V. Taylor, of Salt Lake, is manager, has announced that his company will install early in the spring a refinery of 1,000 barrels daily capacity at Spring Valley Wyoming. The company now has five producing wells and will sink between 20 and 30 during the present year. It owns 16,000 acres of ground in the Spring Valley field.

The Mendha mine at Pioche, Nevada, has been bonded to Salt Lake and Eastern parties. A. W. Scott, of Salt Lake, is manager. The property is to be the scene of a vigorous development campaign.

The Bamberger-Delamar mines at Delamar, Nevada, are to be equipped with a slime plant to be used in working over the old tailing dump, which is said to contain gold values approximating $2,000,000. It is proposed to handle about 750 tons daily. The matter is in charge of Superintendent Frank P. Swindler, whose headquarters are at Delamar.

The copper bullion shipments last week aggregated 955,917 lb., the shippers and the amounts being: Utah Consolidated, 365,417 lb.; United States, 284,762 lb.; Bingham Consolidated, 304,917 pounds.

Spokane. Feb. 17.

Contracts have been let by the Panhandle Smelting Co., of Spokane, for the furnace and engines for its new silver-lead smelter on Lake Pend d'Oreille, Idaho, near the town of Sand Point. The plant should be running in May with an initial capacity of 200 tons a day. It has been promoted by H. M. Williams, of Spokane, and he has interested Minnesota men. Among them are the president, D. W. Casseday, of Minneapolis, land commissioner of the Soo railway; vice-president, W. A. Murphy, a wholesale fruit dealer of St. Paul; secretary, F. W. Guilbert, lately with the National Lead Co., at St. Paul; treasurer, Charles L. Pugh, late of the Wisconsin Knitting Co., of Racine, Wis. The Union Iron Works has been awarded the contract for the furnace and the engines. Bids are being received for the rest of the machinery, which includes the crushing and the sampling equipment. H. M. Williams has been elected manager, but has not selected his technical assistant. E. J. Wilson, lately superintendent of the Northport (Wash.) smelter, served as advisory engineer in preparing the plans. The Panhandle Smelting Co. controls two subordinate companies, the Ponderay Transportation Co., with two steamers, and a line of barges on Lake Pend d'Oreille, and the Panhandle Development Co., which owns the town site near the smelter. The development company also owns a water power on Sand creek, which is expected to furnish 500 h.p. of electricity at the normal stage of the water. The company has spent $7,000 in improving the water power. The smelter buildings, ore bins with a capacity of 400 tons, sampler buildings and ore docks running 2,200 ft. into the lake are completed. The smelting company owns the Venezuela group, near Lakeview, Idaho, which it is developing, and the Queen Anne and the Alice, silver-lead properties, on Trestle creek, near Pack river, Idaho. The smelter is well situated. The lake has a water front of 355 miles in a mineral district; the Northern Pacific and the Great Northern railway touch the smelter site. The survey for the Corbin railway, to connect Spokane with the Canadian Pacific railway, crosses the smelter grounds.

Slush ice in the Cœur d'Alenes has closed every concentrator with the exception of the Tiger-Poorman.

Extensive improvements are planned for the Oom Paul mine near Burke, Idaho. It is the plan to install an electric pump and hoist, to sink a winze 300 ft. Over $20,000 has been spent on development. The Washington Water Power Co., of Spokane, which will furnish long-distance power over a 100-mile line to the Oom Paul, as well as to other Cœur d'Alene mines, will increase the voltage from 45,000 to 60,000. Tests recently at a voltage of 70,000 proved satisfactory. The new working standard is believed here to be the highest voltage in use in the world, and only two or three lines equal it.

Peter Smith, a placer miner working on the Salomon river near White Bird, Idaho, reports that he has secured a hydraulic elevator from San Francisco.

Deadwood. Feb. 18.

The capacity of the Maitland mill is being gradually improved, and last month's tonnage was the largest since the erection of the plant—3,700 tons. The plant has 40 stamps, crushing in cyanide solution. Experiments are being made with the Pyatt process of cyaniding, involving agitation in barrels, similar to chlorination.

The directors of the Victoria Gold Mining & Milling Co. have opened the bids for supply and construction on the new mill, which is to have a capacity of 200 tons per day, employing the dry crushing cyanide process. The Allis-Chalmers company was given the order for power and milling machinery; Jeffrey Manufacturing Co., electric locomotive for the mine; Fish & Hunter Co., Deadwood, tank and vat materials; James Hartgering, Deadwood, was awarded the bid for constructing the plant. Work on the mill will be started early in the spring, and the contracts call for an early completion.

Fifty-six of the 200 ft. of cross cutting from the bottom of the St. Elmo shaft of the Grantz Gold Mining Co. has been completed by the contractors. This work is being done on the 200-ft. level of a new shaft with the idea of tapping a vein worked by former owners of the ground. Otto P. Th. Grantz, of Deadwood, is president and general manager of the company.

The last clean-up of the Horseshoe company amounted to 2,500 oz., the exact value being withheld by the management. It was the result of January's work at the mill. The company has a statement covering the operations from May 1, 1904, to Jan. 1, 1905, in the hands of the printers.

The extremely cold and stormy weather of the present month has caused difficulty at the mines and mills in the way of frozen pipes, etc., and the inability of the railroads to deliver coal has caused some of the properties to partially close down.

Butte. Feb. 15.

Butte mines of the Amalgamated are yielding a greater quantity of ore at present than ever before, the daily average being about 11,000 tons, but notwithstanding this fact, the output is not sufficient to keep all of the machinery at the company's plants in operation. The concentrator at the Washoe has a capacity of 9,000 tons per day, and has been receiving between 6,500 and 7,500, but the company is shaping its mining business in such a way that within a few months the full quantity may be supplied. The Butte and Great Falls plants are taking about 5,000 tons per day. The Speculator company has been gradually increasing its output, the quantity now being mined aggregating 550 tons, an increase of 400 tons per day within the last six weeks. This ore goes to the Amalgamated, being treated in the Washoe plant. W. A. Clark is supplying the Amalgamated with about 250 tons per day, this quantity being in excess of that required in keeping his own smelter supplied.

Stockholders in the Amy & Silversmith company will meet in Butte next month to consider the question of reorganizing a new company and transferring the property of the present company to the new one. They will also consider the feasibility of leasing the property. The Amy & Silversmith is one of the old corporations of this section. It owns a silver-gold producer claim in the northern part of the district, but has not worked it since the fall in the price of silver twelve years ago. Prior to that year it operated on an extensive scale and paid dividends from its earnings. Recent activity among the silver-gold ore producing claims in that section is responsible for the step the stockholders are about to take.

Bad luck has marked the operations of the Reins Copper Co. during the last two months, and it has been expensive. Two weeks ago the workings at the 800-ft. level were flooded by water from the drift, the influx being so heavy that the new 800-gallon pump, not quite ready for work, was submerged. The water filled the openings and backed up the shaft to the 500 before other pumps were secured to handle it. The company is now gradually lowering it with a tank and pumps, but there still remains 200 ft. of shaft and workings to be drained. Prior to the deluge the 800-ft. station caved, necessitating much extra work and expense.

The property of the Leviathan Gold Mining Co., in Madison county, has been sold to the Mammoth Mining & Milling Co., a new organization composed chiefly of Minnesota men. The property was operated eight months last year, its 10-stamp mill crushing about 5,000 tons of $10 ore. Towards the last of the year new oreshoots were opened up in the lower levels, and negotiations for a sale were commenced by A. C. Sanders, C. L. Frederichs and O. G. Schulenberg, the principal owners. These men are still interested in the property, having taken stock in the new company.

Stockholders in the Speculator company will hold a special meeting on Feb. 18 for the purpose of authorizing the sale and transfer of certain mining property owned by the company. The call for the meeting has been issued by M. S. Largey, vice-president of the corporation. The stock is in the hands of half a dozen persons, John A. Creighton, an Omaha banker, and the estate of P. A. Largey, of Butte, being the heavy holders.

Bisbee. Feb. 16.

On the Wolverine mine a drift 1,200 ft. underground, on the Cairo claim, is now 1,100 ft. from shaft, heading toward the Spray shaft, Copper Queen, and 3,000 ft. distant. This drift is now in soft ledge matter, heavily mineralized, and the management is much pleased. The drift is very promising for Pittsburg and Duluth, for it circles about the south boundary of that property. There is but one shaft in Wolverine ground, and the drifts are so long that it has been decided to sink an air shaft at once. This will give two means of egress, and is very necessary. The property is held by the mining company under a bond for a large sum, and many of the original owners of the ground have agreed to take stock in the mining company for their purchase payments, instead of cash, as the bond specifies. This will enable the more rapid prosecution of work, and will change the majority ownership of the company. Work underground will be pushed more rapidly now that these negotiations have been closed.

Calumet & Cochise, which was under bond to Michigan people, who were unable to carry out their agreements, and lost $250,000 in the property, is taken by others and will be again the scene of active work. The shaft sunk by the former operators will probably not be used by the new men, as it is very badly located, and though down 1,000 ft., cannot economically be maintained.

El Globo Mining Co. has been organized to take up partially developed lands near Nacozari and will enter upon active exploration. There are 60 pertenencias in the tract and more than 600 meters of development have been done.

At the Pittsburg & Duluth property a new find of ore of considerable importance has been made within the past few days. This mine is developing rapidly into one of great tonnage. Its ores are largely sulphides.

El Tigre gold mill has been running several days and some results are obtainable. The mill is capable of about 60 tons of raw ore daily, which is concentrated ten into one, and this concentrate is assayed as follows: gold, 2.2 oz.; silver, 440 oz.; lead, 13%; zinc, 16%; iron, 22%, and sulphur, 24%. High grades are still shipped direct to El Paso for treatment, and these concentrates are from the mine seconds. They make a concentrate that is not especially easy of reduction.

The Copper Queen Consolidated Mining Co. has ordered additional smelter equipment to the amount of 10 converter stands. The converter capacity has been below smelting for some time.

Goldfield. Feb. 16.

Goldfield has become the pivotal point of the great district first discovered at Tonopah. This district comprises the towns of Columbia, Jumbo, and Diamondfield, all of which lie within a radius of four miles. The region is just beginning to take on renewed life from its compulsory respite of the past few weeks. The many changes made necessary by the transition of several of the large properties from the hands of the lessees to those of the owners at the beginning of the new year, has retarded the shipping of ore. At present the condition of the five mines that first made the reputation of the camp is as follows:

The Jumbo property is in litigation and therefore idle. The fight is between stockholders.

The Florence mine is busy. Superintendent Oliver, for the owners, has about fifty men at work. In the last four days the mine has shipped 62 tons of ore. There is much $35 ore for milling in addition to the high grade.

The Combination mine is working few men in its levels, has much ore on its dumps, but is holding back development until its mill is completed. This mill is being erected in connection with the mine by Ira C. Boss, of New York City, and will comprise several new features in the line of mill construction. The total weight that falls on the dies will be 1,300 lb. per stamp. The dies rest directly upon a cement bottom, and the only other support is the lug-bolts in the sides. The plant is made up of almost all the usual processes and ends with a special treatment of the slime. The Combination property has more buildings than any other mine of the camp, and shows a most progressive spirit. Mr. Boss completes his work here to go to Silverton, Colo., where he will erect a 40-stamp mill for Mr. Hinds.

The owners of the January mine went into their work with a rush immediately upon receiving the property from the hands of the lessees. The shaft is now being lined up and cleaned out preparatory to sinking below the 350 ft. level.

The Sandstorm is making an average shipment every few weeks. Of the new mines, the Quartzite is, perhaps, doing the best, although the Simmerone is giving a close race. At the former mine there are 42 men employed. A gasoline hoist is in operation. Large sieves separate the fine ore from the coarse, the former being shoveled into sacks and shipped as well as

the latter, although the coarse ore is the high-grade ore of the property. The mine is shipping about 20 tons of ore a day. The Quartzite is about five miles northeast of Goldfield, and is on the opposite side of the same mountain in which the Black Butte made its findings.

The Simmerone lies north and east of Goldfield about two miles. It is widely spoken of just at present, because of its shipment by express of $45,000 worth of ore in a three-ton lot. The Simmerone has been sunk about 30 ft., and the ore is of high grade, mixed with some quantities of a number one milling ore.

A strike has recently been made on the Blue Bull, which is neighboring to the Simmerone. The values run about $300 to the ton at the most conservative estimate.

A most favorable symptom for the future of the camp is the fact that mining men of capital are beginning to invest their money in the town. The days of the poor prospector and the poor lessee are over. Goldfield has reached the point where it is beyond the power of men without capital to proceed. The camp hesitated some time without moving either forward or backward. It can now be safely said that the crucial point is passed.

There are now 15 mines shipping ore. These are, in addition to those already named, the Kendall, Tonopah Club, Black Butte, Lone Star, St. Ives, and Velvet. There are, perhaps, 30 mines depositing ore on the dumps. At present there are five mills under construction. It costs the mines under existing conditions at the following rates: $6.00 for treatment, $12.50 freight Reno to Salt Lake, $6.00 freight from Reno to Tonopah, $7.00 freight Goldfield to Tonopah; total of $31.50 per ton. The American Smelting & Refining Co. pays but $19.50 per ounce, claiming a two and one-half per cent loss in smelting.

Toronto. Feb. 18.

The Lake Superior Corporation, of Sault Ste. Marie, has received from the Canadian government $60,000 as bounty, at the rate of $3 per ton, on steel rails manufactured by them, the doubtful point as to whether the act providing for bounties on structural steel applied also to steel rails having been declared in its favor. The steel works are now turning out between 350 and 500 tons of steel rails per day for the Canadian Pacific railway. Ore from the Williams iron mine, a few miles from the Sault, is being shipped to the works at the rate of about 35 tons a day, and the output is likely to be increased shortly. The ore is stated to be of bessemer quality. Preparations are being made to develop another mine, about 25 miles below the Sault, to increase the supply.

Final arrangements for the erection of a smelter at Port Arthur, Ont., by the Atikokan Iron Co. were made on the 16th. Of the $1,000,000 capital of the company, Mackenzie & Mann, of the Canadian Northern railway, subscribe $400,000, and the town of Port Arthur $300,000, American capitalists furnishing the balance. An agreement to that effect was signed by Mayor Vigaras, of Port Arthur, and Hugh Sutherland, representing the Canadian Northern interests. The principal difficulty in the way has been the quantity of sulphur contained in the Atikokan iron ore, but Mr. Sutherland, in the course of a recent trip to the leading American iron manufacturing centers, found a plant in operation in Pittsburg according to a recently invented process, by which this was satisfactorily overcome. A plant on the same system will be constructed in Port Arthur. A supplementary organization—the Canadian Coal & Ore Dock Co., with half a million capital—will build coal and ore docks in connection with the smelter.

The Nova Scotia administration has declined to remit or reduce the royalty collected on coal mined in the province, in order to encourage the shipment of Nova Scotia coal to Ontario. A movement has been on foot for some time to extend the market for the output of the Cape Breton mines to Ontario, where, in consequence of the development of manufacturing industries, the demand for bituminous coal is steadily increasing. Notwithstanding the duty of 60c. per ton upon imported soft coal, the bituminous mines of Ohio continue to be the source of supply for Ontario, as the Nova Scotia coal comes no further west than Montreal in any quantity.

The Saskatchewan Mining & Development Co., operating near Prince Albert, N. W. T., has brought in extensive dredge machinery to the value of $60,000. Prospecting along the river during January resulted in the discovery of gold and platinum deposits, and preparations are under way for dredging on a large scale during the summer. Temporary buildings, including machine shops, are being put up on the edge of the river.

The British-American Pyrites Co. is developing a new body of iron pyrites in Madoc township, where a shaft has been sunk to a depth of 40 ft. E. L. Fralick, of Belleville, is in charge of the work.

The Canadian Mining Institute has issued Vol. 7 of its *Journal*, containing the proceedings of the convention of 1904. It is a handsome volume of 530 pages, with numerous maps and illustrations.

Victoria. Feb. 14.

East Kootenay.—The Crow's Nest Pass Coal Co.'s financial statement for 1904 shows that a net profit of $406,049 was earned, as compared with $310,492 in 1903. Dividends for the year totalled $347,000, being 10% on the issued stock. Of $1,870,813 brought forward from 1903 to credit of profit and loss, $1,700,000 was transferred to a reserve fund. The company's assets now exceed $6,000,000, as valued in the accounts. Production last year was 744,000 tons of coal, as against 661,000 in 1903. Exports of coal to the United States were 162,000 tons; 216,000 tons were disposed of in Canada, and 366,000 tons made into coke. Coke produced totalled 244,000 tons, of which 106,000 tons were sent to the United States, this being an increase over the amount exported to that country in 1903 of 75,000 tons. The output of the St. Eugene mine, Moyie, for January, is stated to have been 12,918 tons of crude ore, which yielded about 2,520 tons of silver-lead concentrate.

Slocan.—Lessees of the upper workings of the Rambler-Cariboo Co.'s mine have encountered a pay streak varying in width from 6 in. to 2 ft. of clean silver-lead ore of high grade. The work of driving the 4,300-ft. adit to cut the vein at 1,400 ft. depth in this mine is progressing, nearly one-half the distance having been driven. Shortage of water has necessitated the shutting down of the Idaho-Alamo mill. Operations will be resumed as early in the spring as water shall be obtainable. Four district mines have shipped zinc this year, namely, Lucky Jim, Slocan Star, Ivanhoe and Last Chance. A reduction in freight rates to Kansas and Missouri of $1 per ton, from $11 to $10, was made lately. Zinc is receiving increasing attention, both from mine-owners and outside buyers. Local newspapers have entered on a campaign against home smelters, alleging that they have persistently raised their rates for treating lead ores and are getting the major portion of the lead bounty. Both statements have been shown to be quite untrue. On the other hand, smelters have not availed themselves of a right to raise rates, agreed to by mine-owners when the bounty was being applied for.

Ymir.—The striking of a 5-ft. vein of free-milling ore on the Kootenay Belle, at Salmo, in a prospect shaft, at a depth of 20 ft., is reported to be the most important discovery yet made in that section. An adit to cut the ledge at a depth of 125 ft. is being driven. Ore from the Yankee Girl, on Dundee mountain, has been found to contain nickel, but it is not of economic importance under existing conditions locally.

Boundary.—Two American mining engineers lately examined copper properties in the Boundary. W. Lawrence Austin, of New York, spent several days in the Granby company's mines, and M. M. Johnson, of Salt Lake City, Utah, in the mines of the Montreal & Boston Consolidated Company. The first electric locomotive to be used in a district mine recently commenced hauling ore from the Granby No. 3 tunnel. The Strathmore, near Greenwood, which is working on what is stated to be an extension of the Providence Co.'s lead, is now taking out ore from an 8-inch vein yielding a satisfactory margin of profit. The Gold Bug Mining Co., lately incorporated, has let a contract for driving a 300-ft. tunnel on its Gold Bug claim, from which some rich gold-silver ore was taken by D. A. Holbrook before he sold it to the promoters of the company now owning it.

Monterey. Feb. 15.

President Diaz, acting under the power and authority recently given him by the Mexican Congress, has directed Rudolfo Reyes, of Mexico City, son of General Bernardo Reyes, governor of the State of Nuevo Leon, to draw up a new mining code. It is believed that this will greatly relieve mining enterprises of much of the present burdensome taxation that is levied on producing mining properties and is sufficient to keep many of them idle.

It is now known that the smelter in Oaxaca is assured. A $2,000,000 (gold) company has been formed to construct it. Mr. T. J. Ryder, who supervised the building of the Aguascalientes plant of the American Smelting & Refining Co., has resigned his position with the Waters-Pierce Co. to take charge of this Oaxaca smelter, of which he is one of the projectors. It is stated that actual work on the smelter is to begin in March.

In the State of Mexico American capitalists are still negotiating for the smelter and mines of La Negociacion de Arcos y Guadalupe, at Zacualpam (the smelter being at Almoloya), 25 miles from Toluca, but at a higher figure than their former option, which they had allowed to expire. It is understood that there is ore on the dumps worth over $90,000 (Mexican).

The Paul Ginther smelter, at Santa Rosalia, Chihuahua, is to be increased to 300 tons capacity. This on the concession recently granted to Juan A. Creel, with the privilege of transferring to Paul Ginther, general manager for the Encinillas Mines, Ltd., and for which £40,000 was recently raised. By this concession

they are free from all State taxes for a period of 10 years. The mines are at Encinillas.

In Sinaloa a concession for the building of a smelter at Rio Fuerte, on the line of the Kansas City, Mexico & Orient railroad, has been granted to James Francis Gorman and associates. Another concession has been granted to American capitalists for a zone of exploration. This gives to them the exclusive right in the exploration of minerals, in veins or placers, for a distance of 250 meters on each side of the Tomazula river, from the boundary line of the State of Durango down to its union with the Culiacan river, down to the Gulf of California.

London. Feb. 11.

The chief item of interest in the London mining market this week has been the practically simultaneous publication of the report of the Royal Commission appointed to inquire into the Great Boulder Perseverance fiasco, and the holding of the meeting of this company in London, for the purpose of receiving Mr. Ralph Nichols's own explanation. Your readers will remember that last year, when Bewick, Moreing & Co. took over the management —an arrangement which, by the way, has subsequently terminated—they reported that their examination of the mine pointed to Mr. Nichols's estimate of ore reserves being inaccurate, and exaggerated. The controversy as to the correctness, or otherwise, of various methods of developing orebodies, sampling them, and estimating the value of the ore reserves, raged violently for some time. The chief point was that Mr. Nichols had been issuing estimates that enabled the controllers in London to boom up the shares, and people wondered why he should have sent such accounts of the ore; in other words, whether it was part of a plot or whether it was purely carelessness in sampling. At the time, I gave my own opinion in this column, which was that, Mr. Nichols, like many other eminent American mining men, considers exact estimates of ore ahead as unnecessary and impossible, contending that lode mining is not an industry in which long forward estimates of profit can be made, and that the figuring out of the exact values of mining shares for interest and amortisation is a delusion and a snare. After having read through the Commission's report, and Mr. Nichols's own explanation, I have come to the conclusion that my opinion was not far wrong. Part of the mischief was undoubtedly due to Mr. Nichols's prolonged absences on other work undertaken for the controllers of the mine, and the consequent impossibility of giving the matters personal supervision. The fact, however, remains that if he had been a fervent believer in accurate forecasts, he would have had subordinates who were imbued with the same spirit. As it was, his assistants kept no regular records of assays, or sampling, and when they made their estimate of ore reserves, they did it by guess and by memory. The directors and shareholders have wisely retained Mr. Nichols's services, on his promising in future to see that records of development shall be kept in a way more suitable for the needs of a London company. As I have already mentioned, the arrangement with Bewick, Moreing & Co. has been cancelled, and Mr. Edward Hooper has been appointed consulting engineer.

A week or two ago I mentioned that a proposal was in the air to wind up the Robinson South African Banking Co., owing to the inability of the bank to find investments for its money. Since then the whole question has been put before the shareholders and the situation explained in the manner I outlined in my previous letter. As I mentioned, the name "bank" was out of place. Mr. J. B. Robinson is known as a controller of mines on the Rand, and the money of the bank was admitted to be used in financing the various schemes of its promoter. This is not the idea of a bank in England. People did not come to the bank for loans against security, nor for any other business connected with orthodox banking. Shareholders have, therefore, unanimously agreed to give up the bank as such and instead to form a trust company, to undertake what is usually called "merchant ventures." Now that investors really know the nature of the business, there is no reason why it should not prosper in the future.

The new company law of 1900 has not been an entire success. To tell the truth, it was drawn up in a slipshod way, and it really made the tricks adopted by promoters more insidious and more difficult of detection. Two of the most serious consequences have been the registration of companies in other centers such as Guernsey in the Channel Islands, and the issue of no prospectus. There are also other points of objection, but they appeal more to the business man than to the mining engineer. During the year 1904, companies with a total normal capital of £10,000,000 were registered in Guernsey for the furtherance, and it may be said, not untruthfully, that 90%of these were registered there with the express object of putting hindrance in the way of investors who wished to find out full details of the businesses. The growing habit of doing without prospectuses is not confined to fake mining schemes, but is to be met with in all branches of business. The Board of Trade, in response to repeated requests from leading City men, has just appointed a very strong committee to inquire into these points, and to suggest further alterations to be made in company law. The committee is a particularly strong one, including leading lights on company, accountancy, stockbroking, banking and general business. There is not the least doubt that, if the committee gave its best endeavors, individual and collective, it could frame an admirable law. The great drawback of legislation, however, is that after proposals are drawn up by capable and honest men such as these, certain members of Parliament do their best to alter the bill, when submitted for discussion in the House, in order to render its provisions more innocuous to themselves in their other capacities. There are too many men who regard membership of Parliament as the first stepping stone to election on the boards of directors of new companies. It is not to be supposed that they, in their capacity as legislators, would do anything to make things less pleasant for themselves in their capacity as company promotors. This in a few words is the outlook for the new committee.

Perth. Jan. 16.

The gold yield of this State for December was 197,515 oz., and the total of the year 1904, 2,373,021 oz., value £8,424,226. This brings the total value of gold from 1886 to end of 1904 to £54,865,259.

Dividends paid by Western Australia companies during the past year totalled £2,050,559, and the amount paid to date by various companies, £10,284,933.

Kalgoorlie.—At the Ivanhoe the winze on the Horseshoe No. 2 lode, from the 500-ft. level, is in ore worth 12 dwt. per ton. At the same level, the opening up of the Boulder loop lode is going on satisfactorily.

December returns of the Great Boulder Proprietary show 10,496 tons treated for £44,853 yield, or a grade averaging £4 5s. per ton. The manager long ago urged the necessity of reducing the average grade, and results are proving his theory to be correct. The latest returns are 30s. per ton below the grade of the estimated ore reserves in the mine, as set forth in the directors' circular of last September. The Boulder Perseverance is evidently satisfied with results of experiments with the Moore slime process, as a plant to treat 300 tons per day is being erected. The Lake View Consol's main shaft is now 1,900 ft. deep, and within a month will be the deepest shaft on this field, unless the Great Boulder resumes sinking. It is to be hoped the management will continue in order to prove the country below that depth.

The Kalgurli's main orebodies are furnishing good average ore at all points. At the 1,000-ft. level the lode is 25 ft. wide, and has been opened up for a length of 140 ft. At the 750 and 640-ft. levels the lode is very wide and giving payable ore over a width of 60 ft.

Two formations of payable ore have been discovered at the 815-ft. level of the South Kalgurli; one assays 18 dwt. per ton over a width of 11 ft., and the other 21 dwt. per ton over 21 ft. in width. This mine shows a good all round improvement.

Sydney. Jan. 23.

The quantity of concentrate and ore despatched to the seaboard during the year 1904 from the Broken Hill field for export and treatment at the smelting works amounted to 424,997 tons, valued at £1,489,217. A matter calling for special mention is the important increase which has taken place in the export of zinc concentrate. In 1902 the quantity exported was valued at £10,625, in 1903 the value had increased to £86,587, while in 1904 it amounted to £113,118. The quality of zinc concentrate produced during 1904 totaled some 57,000 tons, being the result of magnetic separation by the Australian Metal Co. and the Sulphide Corporation, the treatment by salt-cake at the Proprietary mine, and, in a lesser degree, by sulphuric acid flotation at the Block 14 mine. The Sulphide Corporation reports that the improvements made in smelting at the company's works, Cockle Creek, leave little doubt that the most profitable way of dealing with the zinc concentrate from the magnetic separators is by smelting. The enlargement of the zinc distillation plant is, consequently, to receive attention. The spelter produced by the corporation during the year amounted to 299 tons, and for which a ready market was found. The Proprietary company's plant is doing very satisfactory work. Six pans are in use and about 150 tons of tailing, assaying from 16 to 17 per cent zinc, are treated daily, the residual product assaying 41 to 42 per cent zinc. This company has declared its 140th dividend, the amount absorbed being £72,000. The North Broken Hill company treated 34,500 tons of crude ore during the year and made a profit of £19,000. The average recovery of metals at the mill was 74% of the lead and 53.5% of the silver contents of the ore.

The output of ore from the Zeehan silver field, west coast of Tasmania, during the past year amounted to 52,000 tons, valued at £197,000.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. George Bulmer is examining copper properties in Nevada.

Mr. Colin Timmons, of Los Angeles, is in New York on professional business.

Mr. Ben S. Rives is making a trip of two or three weeks in Mexico.

Mr. T. A. Rickard returns from London by the *Baltic* on February 23.

Mr. T. H. Trethewey is manager of the Molly Gibson mine in British Columbia.

Mr. William A. Paine, president of the Copper Range Co., is visiting the properties of the company.

Mr. E. E. McIntyre, of the Clarines Mining Co., of Santa Barbara, Mex., is visiting in Michigan.

Mr. H. L. J. Warren has recovered from his recent severe illness at Salt Lake City and is now in Denver.

Col. W. C. Greene is inspecting the properties of the Greene Consolidated Copper Co. at Cananea, Mexico.

Mr. J. Parke Channing has been inspecting the properties of the United States Mining Co. at Bingham, Utah.

Mr. Edward C. Knox has been elected secretary of the Montana-Tonopah Mining Company.

Mr. F. J. H. Merrill is examining properties for a New York syndicate in the States of Sonora and Sinaloa, Mexico.

Mr. R. H. Burrows has been appointed manager for the Mineral Development Co. of Guanajuato, Mexico.

Mr. Phillip S. Bates has retired from the management of the *Pacific Miner*, of Portland, Ore., and is succeeded by Mr. W. B. D. Dodson.

Mr. Charles F. Rand, manager of El Cobre mine at Daiquiri, Cuba, is superintending extensive improvements on the property.

Mr. Monroe Layman, manager of the Lewis & Clark telluride mines on Cañon creek, Ore., has returned from a trip to the East.

Mr. H. L. Browne, superintendent of the Descubridora Mining & Development Co., of Santa Barbara, is in San Francisco.

Mr. A. J. Aubrey, a graduate of the Ohio School of Mines, is in charge of the laboratory of the Laclede Fire Brick Co., of St. Louis.

Mr. Ralph Nichols has been re-appointed manager of the Great Boulder Perseverance mine, in Kalgoorlie, Western Australia.

Mr. Edward Hooper has been appointed consulting mining engineer for the Great Boulder Perseverance Co., in Kalgoorlie, Western Australia.

Mr. A. L. Waters has removed from Guadalajara, Mexico, to Matehuala, S. L. P. Mexico, to take a position with La Compañia Metalurgica Nacional.

Mr. J. P. Hutchins sailed on Feb. 18 for Colombia, South America, where he will be engaged in making placer examinations for several months.

Messrs. J. A. McCormick and C. G. Gunther are assisting Mr. W. L. Austin in the examination of the Granby properties at Phoenix, British Columbia.

Mr. E. H. Oxnam, of Los Angeles, Cal., has gone to Palmarejo, Chihuahua, Mex., on professional business and will spend the month of March in that district.

Mr. P. W. Livermore is assisting Mr. M. M. Johnson in the examination of the Montreal & Boston properties at Phoenix, British Columbia.

Mr. H. P. Argall, son of Mr. Phillip Argall, has been appointed assistant superintendent of the Selby Reduction Works, near San Francisco, California.

Mr. Theo. van Wagenen, engineer to the Rhodesia Goldfields, Ltd., is severing his business connections in Rhodesia and expects to leave for United States early in April.

Mr. E. H. Garthwaite, consulting engineer to the British South Africa Co., has returned to Bulawayo, Rhodesia, after a nine months' holiday in England and on the continent.

Mr. Frederick S. Harris, who for two years past has been manager for the Union Zinc & Lead Co., at Shullsburg, Wis., has opened a mining engineering office at 1717 Railway Exchange, Chicago.

Mr. E. L. Byron, who for the past 20 years has been connected with the Vulcan Iron Works Co., of Toledo, Ohio, has been promoted to the position of general manager.

Mr. D. V. A. Williams, of Mexico City, is at Detroit, Mich., where he is purchasing machinery and making arrangements for the construction of a 100-ton custom mill at Marfil, Guanajuato, Mexico.

Mr. George W. Maynard, who recently returned to New York from Arizona, is now leaving for Guanacevi, Durango, Mex., to examine mining properties in that district.

Mr. Duncan McVichie, manager for the Mexican Consolidated Company, has returned to Denver from Boston. He will place orders for a reduction plant for the company's property at Guanacevi, Mexico.

Mr. Charles C. Jones is examining phosphate properties in South Carolina and Tennessee and returns to Salt Lake City early in March. As soon as the season opens Mr. Jones expects to develop his phosphate discoveries in Utah and Idaho.

Mr. T. Trevaille-Williams, for several years manager of the Johannesburg Consolidated mines and more recently manager of the New Unified mine of South Africa, has resigned the latter position on account of urgent family matters and is now in London.

Mr. W. H. Trewartha-James, of Messrs. James Bros., consulting engineers, has left London for Johanensburg. Among the matters which will engage his attention during his visit will be an investigation of the methods of mining and ore treatment on the Rand in order to compare them with West Australian practice.

Messrs. J. W. D. Moodie, C. A. Hardy and G. B. Harrington have formed a partnership as engineers and assayers, with office at Alamos, Sonora, Mexico, with the intention of working in that district. They specially invite American engineers who may be passing through Alamos to visit their offices and rooms.

Messrs. Cecil M. Bryant and E. Philip Gilman, who have for some years conducted the Vancouver assay office and ore-testing works, under the firm name of Pellew-Harvey, Bryant & Gilman, have dissolved partnership by mutual consent. Mr. Bryant will continue to carry on the business under the name of C. M. Bryant & Co. Mr. Gilman will devote himself especially to mine examinations and consulting practice. His headquarters will be at Vancouver, B. C., and he will also have an office in London.

Obituary.

Alpheus Spring Packard, professor of zoology and geology at Brown University, died at Providence, Feb. 14, aged 66 years.

John Frank Jones, joint manager and secretary of the Chartered Company of Rhodesia, died at Sidmouth, England, Feb. 8, aged 44 years. Mr. Jones was one of the leaders in the mining development of Rhodesia. He was a director of the African Concessions Syndicate, Ayrshire Gold Mine & Lomagunda Railway, British Central Africa Co., Wankie (Rhodesia) Coal, Rail & Exploration Co., Rhodesia Railways, Rhodesia Railway Trust and Shire Highland Railway, Nyassaland.

Societies and Technical Schools.

Columbia University.—This institution has established a course in chemical engineering, leading to the degree of chemical engineer. A gift of $10,000 to equip a laboratory of electro-chemistry has been received.

Royal School of Mines.—The 32d annual dinner of the Old Students of this institution was held in London, Feb. 9. Mr. T. A. Rickard, editor of THE ENGINEERING AND MINING JOURNAL, presided, and toasts were responded to by Professor W. Gowland, Messrs. William Frecheville, S. Ramplen Jones, Bedford McNeill, Bennett Brough and others. About 100 old students were present.

Society of Chemical Industry.—The next meeting of the session will be held at the Chemists' Club, New York city, on Feb. 24. The following papers will be read:

C. Richardson and C. N. Forest, 'Tetrachloride of Carbon and Its Use as a Solvent in the Differentiation of Bitumen'; H. Schweitzer, 'History of Artificial Musk'; Wilton G. Berry, 'Tannin and Tanning Materials in Relation to Tariff Classification.'

American Chemical Society.—The New York Section of this society held its fifth regular meeting of the season at the Chemists' Club, Feb. 10. The president, Dr. Francis P. Vanable, presented to Professor Charles Lathrop Parsons, of the New Hampshire College, Durham, N. H., the Nichols medal, which was awarded to him for his paper entitled 'A Revision of the Atomic Weight of Beryllium,' read before the section in May, 1904. Mr. W. H. Nichols, the donor of the medal, was also present and made a few appropriate remarks. The following papers were presented:

'The Accumulation and Utilization of Atmospheric Nitrogen in the Soil,' by E. B. Voorhees and J. G. Lipman.

'The Detection of Methyl Alcohol,' by Heyward Scudder.

'The Origin of Radium,' by Bertram B. Boltwood.

Trade Catalogues.

The MacDonald furnace for smelting ores is described in a circular, issued by the MacDonald Furnace Co., of Toledo, Ohio.

The A. B. C. steel plate fans are described and illustrated in a tasteful little book, issued by the American Blower Co., of Detroit, Michigan.

The Durant counting machines, made by the W. N. Durant Co., of Milwaukee, Wis., are described in an exceptionally tasteful catalogue issued by that company.

'Something Pneumatic' for January, issued by the Chicago Pneumatic Tool Co., contains as usual much interesting matter concerning the tools made by this company.

The Emerson patented steam pumps, quick-cleaning strainers and foot-valves, are described in an attractive illustrated catalogue, issued by the Emerson Steam Pump Co., of Alexandria, Virginia.

The H. W. Caldwell & Son Co., of Chicago, Ill., has issued its general catalogue No. 28. It contains descriptions and illustrations of the well-known conveying, elevating and power transmitting machinery made by this company.

The Merralls Machinery Co., of New York, makers of mining and milling machinery, has prepared a catalogue of its products. It contains descriptions of the Merralls machinery, with testimonials from those who have used it with satisfaction.

The International Acheson Graphite Co., of Niagara Falls, N. Y., has issued a pamphlet entitled 'Extraction, Resistance, Durability,' which describes the method of manufacture in the electric furnace, and use of Acheson graphite for paint pigment. This book will be sent to any one on request.

'Pipe and Boiler Coverings and their Uses,' is a small pamphlet sent out by the H. W. Johns-Manville Co., of New York. It describes various forms of asbestos, and 85 per cent magnesia sectional pipe covering, their use and value for both steam and hot water pipes, and to protect pipes from freezing.

The Murray Iron Works, of Burlington, Ia., has adopted a unique and convincing method of testifying to the merit of their engines. They are sending out four large booklets, which contain photographic reproductions from users of their Murray Corliss engines and other machines. These testimonials are, without exception, enthusiastic indorsements of the Murray machines.

Industrial.

The A. D. Granger Co., contracting engineers, of New York, Philadelphia and Pittsburg, announces the opening of a Pittsburg office under the management of E. W. Bentley, in the Bessemer Building, Pittsburg, Pa.

The S. H. Supply Co., of Denver, is shipping the material for a complete 50-ton concentrating plant to the Homelit Mining Co., at Silverton, Colo. A carload of pumping machinery to Parral, Mexico, is also a recent shipment by this company.

Adam Cook's Sons, 313 West street, New York City, the makers of Albany grease, recently sent some samples of their grease to the Charleston Gas & Electric Co., Charleston, Ill. After testing this, E. C. Jenks, the manager, writes: "The samples shipped this company are all right, and we have ordered a supply from the Geo. Henseler Oil Co., St. Louis, Mo."

The Marion Steam Shovel Co., of Marion, Ohio, has closed a $250,000 contract for five dredges, to be used in the California gold fields. The dredges will have 75 buckets in their bucket line, each with a capacity of 7 cu. ft. The largest dredges heretofore constructed have had only 65 buckets of 6 cu. ft. capacity. The machines will aggregate 2,000 tons in weight, exclusive of framework and hulls.

The Harrisburg Foundry & Machine Works, of Harrisburg, Pa., recently received through their New York representatives, Mackenzie, Quarrier & Ferguson, an order for eight Fleming engines, to be arranged for direct connection to Worthington centrifugal pumps. The engines are to be installed in the power houses of the New York Central & Hudson River Railroad Co., at Yonkers and Port Morris.

The rapid introduction of mechanical draft as a substitute for chimney draft has been noticeable. A recent installation of considerable interest is that made by the B. F. Sturtevant Co., of Boston, Mass., for the Marquette Manufacturing Co., La Salle, Ill., where ten 150 h.p. horizontal tubular boilers have been equipped with a large engine-driven fan applied as a substitute for the chimney to induce draft through the grates.

The Westinghouse companies have just entered an order for the equipment of a power house for the electrical operation of gold-dredging boats on the Alaskan rivers. The plan is an entirely new one and involves many interesting features. The power house will be located at Dawson City, and the dredges will operate on the Yukon river and its tributaries. Lines for transmitting power will be strung from the station to the boats, wherever they may be working. Electrical machinery is used very extensively in mining operations, but this plant will be watched with considerable interest, owing to the remoteness of the country and the new field which will be opened.

One of the features of the advent of electrically driven machinery has been the development of the electric fan. Originally the pulley-driven fan appeared to fulfil the requirements of the purchaser; soon, however, the steam fan with direct-connected engine displayed its utility, but to-day the fan driven by an attached motor has shown its general superiority, and is rapidly supplanting the steam fan. Progress along this line has been largely due to the B. F. Sturtevant Co., of Boston, who have been known for years as the largest manufacturers of fan blowers in the world. For years past, they have been gradually perfecting designs and keeping abreast of the times in this important branch of engineering.

The Lima Locomotive & Machine Company is building for the Holly River & Addison Railway Co. one 10-wheel locomotive, class 0-6-4, having cylinders 13 in. diameter, 18 in. stroke. This locomotive will be equipped with Eames vacuum brake on both engine and tender and will be fitted with all modern fittings such as Sellers' injectors, Ashcroft steam gauge, Detroit sight feed lubricators, Hayden pop valves, etc. The company is also building a double end locomotive, class 2-6-2, with separate tender, for the Crowell & Spencer Lumber Co., Long Leaf, La. This locomotive has cylinders 15 in. diameter, 20 in. stroke, and will be equipped with the Lima Locomotive & Machine Co.'s own make steam brake, which is very powerful and effective. This locomotive as well as the one for the Holly River & Addison Railway Co. will be furnished with all modern fittings. The company also has orders on its books for a 12 by 16 in. cylinder, four-driver saddle-tank, for the Puget Sound navy yard at Bremer, Washington, and one small mine locomotive for the Margaret Mining Co., Welsh, W. Va. The company reports business good in its geared locomotive department, and has recently shipped a number of plantation type locomotives to Mexico.

General Mining News.

ALABAMA.

JEFFERSON COUNTY.

Virginia.—The explosion of a "dry shot" in the mouth of this coal mine, owned and operated by the Alabama Steel & Wire Co., at Virginia, five miles south of Bessemer, on February 20, resulted in the complete closing of the mine, in which there were working at the time 150 miners.

ARIZONA.

COCHISE COUNTY.

Paradise.—At the Chiricahua Development Co.'s property it has been decided to cut a station at the 400-ft. level and crosscut to the ledge instead of waiting until the 500-ft. level is reached, owing to the fact of encountering the mineralized zone of the property at the 400-ft. depth. The lime at this point is heavily impregnated with iron pyrites, copper stained. Getting this ore in this shaft at this depth was entirely unexpected, but shows, to a degree, the large extent of the orebodies and gives an indication of what may be expected after getting below the leached material. The bottom of the shaft is about 600 ft. from the known ledge, and with the finding of ore at this point shows a mammoth ore zone in this property. There seems to be no doubt that the mineral has penetrated the lime from the ledge for over 600 ft.

The Leadville has changed hands, and under the new ownership of Andrew Snedden and Wm. Cox, both of Tombstone, Arizona, development will be pushed.

At the Walker group, east of Paradise, the owners are preparing to start a crosscut adit in the side of the hill and will run the adit about 150 ft. to cut the ledge. They will gain a depth of 175 ft. by this work, which will materially assist in opening up the property. The owners, Messrs. Walker & Meyers, have a good surface showing in this group, the contact being 75 ft. wide. They have two shafts, one down 50 ft., from which depth they crosscut 50 ft., and are still in the ledge, the ore being a mixed leached material partly carbonate and partly sulphide. The other shaft is now down about 30 ft. and has exposed the top of a body of high-grade sulphide ore that assays show carries 14% copper, some silver, gold and lead.

At the Savage mine Mr. Lewintowsky has concentrated his forces in a main shaft that will be sunk 500 ft. before cross-cutting. The ore is reported to run high in silver, the assays showing 150 oz. of silver, a little gold and 8% copper.

CALIFORNIA.

AMADOR COUNTY.

Burlington. — Superintendent Lutellus Smith has purchased for this mine, near Sutter Creek, the machinery and equipment formerly owned by the Stockton Hill Mining Co. at Mokelumne Hill.

BUTTE COUNTY.

Phoenix Mining Co.—The mill of this company, operating at El Dorado, is superintendent, is kept constantly crushing ore.

EL DORADO COUNTY.

Capitola Mining & Milling Co.—This company operating at El Dorado are working on a ledge which is at present 16 ft. wide.

American River Consolidated Mining Co.—This company, organized to mine a

long stretch of the American river below where the water is diverted by the electric power company, is preparing to commence operations.

Monte Consolidated Mining Co.—This company has been formed to work the Monte mine, the incorporators being the following residents of Sacramento, the principal place of business: S. R. Hatch, A. Marty, W. A. Hall, J. B. Miller and W. T. Shurtliff.

INYO COUNTY.

Frank Everett, president of a company operating at Swansea, has put up a five-stamp mill on the site of the old Swansea furnace, and will work over a large amount of slag made in running the furnace many years ago.

Casa Diablo.—This property, in Sherwin district, 20 miles northwest of Bishop, is under bond to a Chicago company, C. A. Fohrman, manager. A 1,000-ft. tunnel is being driven to crosscut five veins which outcrop. It is expected to finish this tunnel by August, and in the meantime work continues in the upper levels. A four-stamp mill is on the property, and arrangements are under way for a 30-stamp mill and cyanide plant.

Southern Belle Mining Co.—This group, at Laws, A. E. Vandercook, superintendent, includes the Southern Belle, New Year, Golden Wedge, Harriet, Bullion, Emerson and Mt. Chief. These are old properties, and three of them are now being worked by the company, through two tunnels. Five stamps are crushing ore and five more are to be added this month. The water for power is brought from Coldwater creek in an 8,000-ft. flume and 700 ft. of pipe.

KERN COUNTY.

Yellow Aster Mining Co.—Two Burleigh drills have been set at work in this mine at Randsburg. Electric power, instead of mules, is to be used for hauling the ore to the mills. The capacity of the reservoir at the pumping-back plant is being enlarged.

NEVADA COUNTY.

Zeibright Mining Co.—In this mine at Little Bear valley, a body of ore showing well in free gold has been found in the main stope about 50 ft. above the tunnel.

Banner.—In this drift mine, Superintendent Charronat is getting ready to crush gravel, and flumes, dumps and sheds are being constructed.

PLACER COUNTY.

Three Star Mining Co.—This company, near Auburn, B. F. Hartly, superintendent, has made a very satisfactory clean-up for the past month.

SHASTA COUNTY.

Detroit and California Gold Mining Co.—O. B. Perry, of the Indiana Dredging Co., of Oroville, has purchased a half interest in the dredge and ground of this company near Horsetown. New ground is being prospected by Keystone drills, and a second dredge is to be built.

Wheelock.—This mine in Lower Springs district, adjoining the Melton and White Oak, is being inspected by Eastern men with a view to purchase.

SISKIYOU COUNTY.

Medina Gold Mining Co.—This company, operating the Johnson mine at Oro Fino, has installed its air compressor and is now utilizing the new Burleigh drill plant.

TEHAMA COUNTY.

Uncle Sam.—Lee Johnson and William Moore, of Bee Gum, are working this mine, the ore of which carries gold, silver and copper. There are several parallel ledges on the property.

TUOLUMNE COUNTY.

Draper.—The mill at this mine is kept steadily running and will be increased five stamps. A larger hoisting plant has been decided on.

Nigger Hill.—Frank Stephenson is working this mine, near Columbia, for San Francisco men, with good prospects.

Clio.—A crew of men has been set at work re-opening this mine.

Densmore Mining Co.—The stockholders have subscribed funds for developing this property, and Andrew Crowell, as manager, will begin work at once.

Jumper Gold Syndicate.—Mark B. Kerr, having resigned as superintendent and manager of this extensive property at Stent, M. D. Kelly, a former superintendent of the mine, has been appointed in his place.

YUBA COUNTY.

..Colmera Olive Co.—The lands of this company, east of Marysville, near Ostrom, have been tested and prove to be above the average value for dredging. The land is now planted to grapes, oranges and olives.

COLORADO.

BOULDER COUNTY.

It is reported and on good authority that a new mill for the treatment of tungsten or wolframite ores will be erected at or near Nederland during the spring months by Eastern parties who are heavily interested in tungsten mining and who are represented by A. Neresheimer, of Nederland, Colo. The Easterners have been leasing a mill for several months, which was overhauled, but they find the need of more modern and larger milling facilities.

Dameral Gold Mining Co.—Denver parties are interested in a group of claims between Nederland and Rollinsville, and they have uncovered a large body of silver quartz carrying values of from 30 to 50 oz. silver per ton and expect to be able to soon ship via the Eldora branch of the Colorado & Northwestern road. J. Dameral, Nederland, is in charge.

Pilot.—Another good strike is reported from this mine, seven miles west of Boulder City, the ore find in the 180-ft. level being over five feet wide and carrying average test values of from $40 to $50 per ton for entire width, and heavy shipments are planned. A large body of low grade ores was recently opened up and Kansas parties who are interested are contemplating the erection of a mill during the coming spring. C. A. Wolcott, Sunshine, Colo., is interested in the management.

CLEAR CREEK COUNTY.

Wisconsin.—This property on Sherman mountain, near Silver Plume, has changed hands, the option for $10,000 having been taken up by C. S. Desch, of Silver Plume, Colo., who has consolidated it with the Corry City group. During the five years' lease and bond operations, it has produced $100,000, and it is reported that the property is in shape for a good production. It is understood that a new company with large financial backing will take hold of the consolidated properties, which are silver-lead producers, and that extensive work will follow.

Little Mattie.—Ore in the sixth level carries assay values of $260 per ton and the streak is 18 in. wide and averages $100 per ton. This is what is known as the Pike & Co. lease.

Edgar.—An orebody opened up on this vein from the central tunel has been exploited for nearly 50 ft., and careful tests show values of from $50 to $80 per ton, the ore being from two to over three feet wide. The property is being operated under lease by Idaho Springs parties as the Spanish Bar Mining and Leasing Company.

Honest John Tunnel.—At this property, up Chicago creek, at a distance in of 1,100 ft., a vein has been cut which shows a two-foot pay streak of quartz liberally mixed with lead, gray copper and zinc, carrying assay tests of nearly $40 per ton.

Brighton.—An eight-inch streak of black copper ore has been made in the fourth level of this mine at Freeland, which gives assay values of .20 oz. gold, 49 oz. silver and 57.9% copper, a value of $134.67 per ton. The property is showing up lots of medium grade ores and the Pittsburg owners will erect a mill at the mouth of Fall river this spring for the treatment of the Brighton ores. Davis Ellis, Idaho Springs, is manager.

Bertha.—The S. H. Supply Co. of Denver, is furnishing the Bertha company with 20 900 lb. rapid drop stamps for new addition to the mill at Idaho Springs.

Dover & Brighton Mill Co.—A new incorporation with capital stock of $30,000, incorporators W. M. Laird, W. R. McCabe, T. Liggett, T. Hannah and R. L. Welson, main office in Idaho Springs. Pittsburg parties are interested and they will build a 50-ton milling plant.

P. T.—Peter Theobald, of Idaho Springs, has taken a two years' lease on this and a group of claims owned by Colorado Springs parties, and will operate the property with sets of leasers. The machinery has been overhauled, and ores taken out have been given returns of 29 oz. gold per ton. The property is in the Jackson district.

Brazil.—Colorado parties are interested in this property near Lamartine and a recent shipment brought net returns of $49.16 per ton, these ores being taken out in driving the tunnel. George Riley, Idaho Springs, is manager.

GILPIN COUNTY.

Williams.—This property, in Lake district, has been leased and bonded to St. Louis, Mo., parties, and the management placed in the hands of E. Drake, Central City. The property has produced heavily in gold and silver.

Russell Mining Co.—Missouri and Kansas parties operating in Russell district have temporarily suspended operations for about 30 days, pending the installation of larger and improved machinery. They may decide to install electric machinery. F. L. Paxton, Russell Gulch, is superintendent, and liberal developments have been kept up for a considerable time.

Rock-Gardner.—C. Houser & Co., of Bald Mountain, have taken a lease on this property on Quartz hill and are working in the 350 and 1,000-ft. levels, where they have some fair looking milling and smelting ores and expect to be able to make regular shipments. Eastern parties are owners.

Chase.—A rich strike has been reported in the fourth level of this mine, in Willis gulch, the ore carrying values of over 30 oz. gold, besides silver and copper. The property is being worked by leasers. J. A. Gilmour, Central City, is manager for St. Louis, Mo., owners.

Claudia J. and Millie B.—W. H. Kelly, of Black Hawk, has leased and bonded these claims in Hawkeye district to the

Money Metal Mining and Milling Co. for two and one-half years in the sum of $25,000. Operations are to be commenced at once, and machinery is to be installed in the spring months.

Penobscot Mining & Milling Co.—Valley Falls, Kan., parties are interested in a group of mines in Independent district which are being liberally developed with a good showing reported. The ores carry, besides gold and silver, liberal lead and copper values, and the company will figure on erecting its own mill during the spring season, probably of the concentrating pattern. P. J. Hamble, Perigo, is manager.

Robert Emmett.—Ryan & Co., of Perigo, have leased this property on Perigo hill and are doing development work, and will install a plant of machinery at an early date. Surface ores from the property are reported to have given above average results.

Pewabic.—Ore has been uncovered in the 300 old workings carrying assay values of 14.95 oz. gold, 41.85 oz. silver and 11½% copper, or $335 per ton. Eastern parties are interested, and new shaft buildings and a first-class plant of machinery have been installed, and liberal developments are planned. J. C. Fleschhutz, Central City, is manager.

El Capitan.—A. M. Willard, of Gilpin, Colo., has sold an interest to Walton, N. Y., parties in this group of claims in the northern districts, for a consideration of $4,000, and operations are to be carried on in good shape.

SUMMIT COUNTY.

Sallie Barbara.—Cañon City and Leadville parties have purchased this property on Nigger hill for a consideration of $10,000, after a careful examination and tests of the ores. The main shaft is down 270 ft., a plant of machinery is to be installed and it will be operated as a zinc-lead property. T. R. Keith, Breckenridge, is in charge of the property.

TELLER COUNTY—CRIPPLE CREEK.

Empire State.—Work has been commenced on this property on company account; a new hoisting plant is to be installed and considerable development work has been plannned. This property was recently consolidated with the Isabella Gold Mining Co., and is now owned by the Isabella Mines Co. The entire property formerly belonged to the Isabella Gold Mining Co., is under lease to Murphy & Hamlin and associates, but this does not include the property formerly belonging to the Empire State. A large amount of ore has been shipped from this property which was at one time owned by the Orphan Belle Gold Mining Co. Mr. George Kilbourne, of Colorado Springs, has personal charge of the property.

Portland Gold Mining Co.—The eleveleventh annual report of this company shows the production of this mine during 1904 to be 96,521,385 tons, which produced 129,899,691 oz. of gold, having a gross value of $2,598,724.84, which, after deducting sampling, freight and treatment charges, shows a net value of $1,889,748.36. The net profits of the mine for the year, after paying all expenses, were $814,411; $720,000 was paid in dividends during the year. The treasurer's cash balance on Jan. 1, 1905, amounted to $691,184. The reports of officers of the company show the mine to be in a very good physical condition. The majority of the board of directors issued their usual report. Mr. James F. Burns, who has been president during the past year, has also issued a separate edition of the same report, with the addition of a number of criticisms of his own. During the past year the majority of the board of directors and the president, Mr. Burns, have not agreed upon the policy of the company with regard to the labor difficulties, hence there has been considerable feeling in the matter. Since the 20th of June, 1904, the mine has been controlled by the majority of the board of directors.

Stratton's Independence Ltd.—Good headway is being made on the erection of the ore house which is to take the place of the one that was recently burned. Some work is also being done on an experimental mill which is being erected to handle the ore in the dump. The mine is at present making considerable production, principally by lessees.

Gold Exploration Tunnel.—Work is being pushed in this tunnel, and it is understood that the breast is now in the neighborhood of the top of Raven Hill. The tunnel is the longest in the district, being somewhat over a mile and a half in length. Several lessees are taking out ore through the tunnel. The main workings of the tunnel are under the supervision of J. M. Parfet, of Cripple Creek.

Triumph Gold Mining Co.—The injunction which has been in force against this company for nearly two years, was dissolved this week in the District Court, on motion of the plaintiff's attorney. The plaintiff in this case was the Ajax Gold Mining Co., which has had the Triumph enjoined from shipping any ore. The dissolving of this injunction means that considerable ore is now free to work. A lease will be let immediately on this property, and it is expected that a good production will be made in the near future.

Gold Bond Consolidated Mining Co.—Lessees Russell & Storke have just completed the timbering of their new shaft to the first level. It is understood that the shaft will be immediately sunk to a considerable depth, and undoubtedly a large amount of ore will be opened up. Considerable ore has already been shipped from this property in the past, but no development work at depth has ever been done. The property is situated on Gold Hill, near the Caledonia mine.

IDAHO.

BOISE COUNTY.

Dewey.—The mill on this property, at Thunder Mountain, is credited with a production of $80,076 of bullion in eight months of 1904. During four months it was closed down for repairs to machinery. The ore crushed was 8,531 tons, averaging $9.39 per ton. The saving on the plates averaged 82.8 per cent.

CUSTER COUNTY.

White Knob Copper Co.—Work has been resumed at the properties of this company, at Mackay, by N. H. Clark, the receiver. It is the intention to employ a force of about 40 men at the mine during the next 60 days, doing maintenance work upon the property. At the end of that time, it is expected, arrangements will be perfected to discharge the liabilities of the company, and, incidentally, the receivers.

ELMORE COUNTY.

Daisy.—This company, in the Neal district, has passed to Emery W. Fisher, representing the Western Trust Co. It is reported that the property will pass to a merger company, which already owns other properties in Idaho, in Arizona and Wyoming. The capacity of the mill on this property will be increased and Wilfley tables installed.

IDAHO COUNTY.

Boyer.—It is reported that the mill on this property will start operations at once. Recent developments are said to be favorable.

NEZ PERCES COUNTY.

Gold Seal Mining & Milling Co.—This company, at Lewiston, will merge with the Missouri-Idaho Mining Co. The new company will be known as the Missouri-Idaho Consolidated, and will have a capitalization of $1,500,000, and stockholders in either of the old companies will receive one share of stock in the new company for two shares of the old. The consolidation gives the company 15 claims in the Four Mile district.

INDIANA.

Many mines in Indiana have not worked for the past week, owing to the congestion of loaded coal cars on the principal roads reaching from the coal fields. This condition was due to severe cold weather. Prices at the mines were never in the condition they are now. Prominent operators say the established price that has governed the sale of coal at many mines for some years is lost sight of. Operators are struggling for a market, and are selling coal at any price they can get. Hundreds of barges and flat boats covering acres and acres are frozen fast in the Ohio river along the southern border of Indiana. These "coal runs" are the product of Pennsylvania mines and much alarm is felt for their safety when the ice breaks up. Preparation is being made for the usual interesting and exciting events of a spring flood, but never before were there so much coal locked up in the ice as at present.

The stockholders of the Gold Creek Mining Co., which has placed modern mining machinery in the hills of Morgan county, is ready to begin the first practical mining in Indiana as soon as the ground thaws. The machinery is set and has been tested. A great deal of interest will attach to this first effort to wash Indiana gold by Western or modern machine methods. For more than 50 years it has been known that there was gold in the hills of Morgan and Brown counties. People have been washing it and selling it in the market for 50 years, and with nothing more than the miner's pan have averaged a dollar or more a day. Many have done much better. State Geologist Blatchley estimated the run of the dirt to be worked from 30 to 80 cents a yard, and says it can be worked at a great profit. The company has 640 acres of leases to work. The company's machinery will work 100 cubic yards a day.

CLAY COUNTY.

Capital Coal Co.—This company has filed with the county recorder in Brazil, 56 leases on as many pieces of coal lands in this county. It is also reported that the same company has taken many coal leases in Green county. The Capital Coal Co. was incorporated in May, 1903, with a capital stock of $100,000.

LOUISIANA.

CALCASIEU PARISH.

Jennings.—A contract has been let by Bass & Benckenstein for a pipe line from this field to the Atchafaya river. It will be about 45 miles long, will have a daily capacity of 10,000 bbl. and will cost approximately $300,000. The Wilkins Oil Co. No. 3 is in and flowing 2,000 bbl. daily. The production is still declining—it is now below 40,000—oil prices are

stiffer, but the market price is now down to 17c. to 20c.

CADDO PARISH.

Shreveport.—The Caddo Oil & Pipe Line Co., of Shreveport, has succeeded in obtaining a 200-bbl. pumper at a depth of 1,564 ft. The new field is 20 miles from this city. Savage Morical & Co. are drilling two other wells, which are down 1,000 ft. and 700 ft., respectively.

PENNSYLVANIA.

ANTHRACITE COAL.

Empire Coal Co.—At the annual meeting of this company the following directors were elected: J. R. Paull, R. W. Frank, W. L. Kann, Jacob Kaufmann, Edward Kneeland, Lewis S. Newman, George Paull. Two directors resigned, T. H. Bakewell and W. L. Berger, their places being taken by Edward Kneeland and George Paull.

Enterprise.—This colliery, in Shamokin, has resumed operations. It has been closed down since Oct. 16, 1904, owing to fire in the workings.

Lytle.—Six men were killed and 14 injured at this colliery, at Pottsville, on Feb. 18. The men were being lowered down a slope into the mine in a "gunboat," or car, when the latter jumped the track and knocked out several props. This caused a fall of top rock, and six of the men in the "gunboat" were crushed to death. Ten of the injured are not in a serious condition.

BITUMINOUS COAL.

Hazel Kirke Gas-Coal Co.—The properties of this company, near Monongahela City, have been sold to Kuhn Bros. of Pittsburg for a reported price of $1,000,000. This mine has an output of from 2,000 to 2,500 tons per day. It covers a territory of 1,600 acres. Its product is a particularly high grade of gas-coal. The Hazel Kirke Co. still has some holdings in coal property and will continue in business.

United Coal Co.—This company, composed of McKeesport and Pittsburg capitalists, has taken steps to open a new coal field near Bentleyville. The company has several thousand acres near the Monongahela & Washington railroad, the outlet for the Ellsworth mines, and the plans now under way contemplate an extension of the road to the new field.

Pittsburg Coal Co.—The annual report of this company shows that profits, after deducting all expenses, were $4,261,511, compared with $7,787,094 in 1903. In its table of assets the company values its coal mines at over $78,000,000.

TEXAS.

HARDIN COUNTY.

Saratoga.—There have been five new wells brought in since last report: Producers' Oil Co., flowing 2,000 bbl.; Moonshine Oil Co., No. 3; Santa Fé No. 7, flowing 600 bbl.; Santa Fé, No. 9 flowing 1,600 bbl.; Guffey-Harrington, No. 3, flowing 2,000 bbl. Salt water is very troublesome in the old wells and is reducing the output considerably. Crude brings 20 to 23 cents.

HARRIS COUNTY.

Humble.—Higgins Oil Co.'s No. 1 came in a gusher at 1,200 ft. It is said to be flowing 5,000 bbl. daily into a storage tank 2,000 ft. distant by natural pressure. The Abercrombie & Parafine Oil Co. wells are regulation gushers, with steady flow. Humble oil is on the market. Ten cars have been shipped by rail and several thousand barrels have been sold at 12½ cents.

JEFFERSON COUNTY.

Beaumont.—The United Oil & Refining Co. has completed its canal running from the Neches river to its plant. Nelson & Gordon have started a well close to the National Oil & Pipe Line Co.'s pumper. Batson oil brings only 20c. at the well and prices here range from 30 to 33c. Operators here who are in a position to hold oil are not inclined to sell at present prices. They state that notwithstanding many new gushers in Texas and Louisiana have been brought in, that it is doubtful if the actual output of oil has increased to one-half the extent supposed by most people. The gushers do not maintain their initial output for any length of time and salt water is playing havoc in most of the fields.

UTAH.

BEAVER COUNTY.

Frisco Contact.—The new hoisting plant at this property is being installed. The equipment will carry the shaft to 1,000 ft. depth.

Skylark Copper.—The management is completing the patenting of several claims.

Majestic Copper Co.—Development work is progressing at all the properties of the company in about the usual manner. Mr. Newhouse will inspect the company's holdings during the coming week, after which he will announce definitely his policy for the future.

JUAB COUNTY.

Tintic Shipments.—For last week shipments consisted of 75 carloads, the shippers and the amounts sent out by each being: Centennial-Eureka, 46; Bullion Beck, 2; Gemini, 7; Grand Central, 3; Mammoth, 6; Carisa, 1; Eagle and Blue Bell, 6; May Day, 1.

Uncle Sam Consolidated.—A cross-cut driven through a large dyke, between the main workings and those of the May Day Mining Co. has encountered an extension of the vein opened in the May Day several months ago. The ore seems to be in quantity, but is of a low grade and will require mill treatment to pay.

WASHINGTON.

FERRY COUNTY.

California.—A lifting pump has been provided and the mine unwatered to 10 ft. below the third level. A small force is prospecting on three levels and getting out a little good ore.

Mountain Lion.—Stoping will be resumed as soon as arrangements can be made for delivery of ore to the smelters, expected to be completed in a few days.

Republic Power & Cyaniding Co.—The dismantling of the mill is nearly finished. Mr. W. G. C. Lanskail, secretary of the company at Republic since 1901 and trustee for the company and its creditors for some time past, has gone to Toronto, Ont., to meet the president and trustees. Nothing is known in Republic in regard to the settlement of the debt, but it is supposed here that the remaining property will be turned over to the bondholders.

Oversight.—A double compartment shaft will be sunk and machinery provided for that purpose.

Copper Key.—During the past two months 2,215 carloads of ore have been shipped to the smelters and reported to have paid a profit over mining, transportation and treatment. Seven teams are employed hauling over a snow road. The new tunnel is in 41 ft. and is expected to tap the vein about May 1. The vein is over 40 ft. wide. The ore is mostly iron oxide and soft, requiring considerable timbering.

Quilp.—Twelve men are employed stoping ore. A carload a day is going to the Granby smelter, at Grank Forks, B. C.

Foreign Mining News.

AFRICA.

TRANSVAAL.

The gold production for the month of January is reported by the Transvaal Chamber of Mines at 369,258 oz. fine gold. This is 6,994 oz. more than in December, and 80,434 oz. more than in January, 1904. The labor return shows that during the month 11,773 Kaffirs were added to the working force, and 6,939 left; a net gain of 4,834 laborers. No statement is made as to the number of Chinese at work.

ASIA.

INDIA—MYSORE.

Kolar Goldfield.—The production for the month of January is reported at 51,707 oz. bullion, which is 983 oz. less than in December, but 119 oz. more than in January, 1904. This bullion was equal to 46,536 oz. fine gold, or $961,899 in value.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending Feb. 11 were as follows, in tons: Granby, 10,230; Mother Lode, 3,328; Brooklyn, 1,944; Rawhide, 1,417; Mountain Rose, 190; Emma, 330; Senator, 363; Oro Denoro, 33; Providence, 20; Elkhorn, 20; Last Chance, 20; Sky Lark, 20; total output for week, 17,923 tons; total for year to date, 91,188 tons.

BRITISH COLUMBIA—NELSON DISTRICT.

Molly Gibson.—This property consists of four full claims and two fractions, which are being developed by four tunnels aggregating 2,100 ft., exposing 925 ft. or more of smelting and concentrating ore. In January 110 tons of high grade ore were shipped to the smelter, the greater portion of which was taken from development. Twenty-five men are employed. The company is being reorganized with a view to providing means for the installation of a concentrator, compressor plant, saw-mill, etc. There is ample timber on the ground; the power is supplied from a creek crossing the property. Capt. T. H. Trethewey is in charge.

MEXICO.

GUANAJUATO.

Mineral Development Co.—At the annual meeting of this company the following officers and directors were elected: President, Capt. W. Murdoch Wiley; vice-president, R. V. Morris; secretary and treasurer, J. R. Van Doren; executive committee: W. Murdoch Wiley, Theodore Dwight and L. H. Taylor, Jr.; directors, R. V. Morris, Theo. Dwight, Chas. E. Lydecker, Joseph Struthers, L. H. Taylor, Jr., Carl Henrich, J. E. Van Doren, W. Murdoch Wiley and James Virdin. The annual report states that of the preferred stock of 20,000 shares at $50, 5,973 shares have been sold. La Planta mine, at Guanajuato, has been purchased in full, together with three-fourths of the capital stock of the Nueva Luz Mining Co., and four-fifths of the capital stock of La Torre Mines Company.

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Valuing Mineral Lands for Taxation.

SPECIAL CORRESPONDENCE.

The value of mineral rights for taxing purposes was discussed before the New Jersey State Board of Taxation, in session at Dover, Feb. 15, in the cases of the Crane Iron Works against Jefferson township and Roxbury township in Morris county. In Jefferson township the Crane Iron Works is assessed $1,500 on an abandoned mining property, composed of 2.8 acres of rough land, and on the mineral rights in 410 acres adjacent; the company appealed to the State board for reduction to $100. In Roxbury township the company owns 11.52 acres of land and the mineral rights in 209 acres adjacent. This property is also assessed at $1,500, and the Crane Iron Works asked the State Board for a reduction to $200. The contention of James M. Hodge, attorney for the mining company, was that the valuations were both excessive, as the land owned was worth not more than $5 or $10 an acre, and the mineral rights were worth nothing at all.

Major Carl Lentz, of Newark, chairman of the State Board, ruled that mineral rights were assets and could be assessed, the only question being their value. The company showed that the mineral rights were not carried on its books as assets although they had been in former years. Some of the mines in question have not been worked in 30 years. George E. Jenkins, an engineer of Dover, gave testimony as an expert, that the mineral rights were worthless and that the mines were without value, unless the price of iron should go to $60 per ton. He testified that while there was a large vein of ore, it was very lean and had been worked as long as it could be worked with profit.

The township assessors told the State Board that they had made a uniform assessment of $1,500 on all abandoned mining properties in their township, with the intention of raising the valuations should the mines ever be re-opened. They argued that the mining company would not sell any land without reserving the mineral rights, and would not give up the mineral rights on land already sold, even though the mines have been idle so many years. One witness gave it as his opinion that the mines in some cases had been abandoned, not because they were worked out, but because the company owned them and had pulled up the machinery to work leased properties.

The question of the tax value of mineral rights is one of great importance to the townships in question, as none of the mines is now being worked. The State Board reserved decision. The only mines of any importance in operation in Morris county are the Wharton, Andover and Glendon mines at Hibernia in Rockaway township; the Richard mine, the property of the Thomas Iron Company, also in Rockaway township; the Mt. Hope mines of the Empire Steel & Iron Company and the Hurd mine at Wharton.

The Empire Steel & Iron Company has also appealed from the assessment of its Mt. Hope property by Rockaway township. The company is assessed $70,000 on 1,500 acres, part of which is barren and rocky, part swamp land and about 200 acres fair timber land. The company asks reduction to $35,000, but the case was not argued owing to the absence of the township attorney.

Washington Coal.

The eleventh biennial report of C. F. Owen, Washington State inspector of coal mines, gives the following figures:

	1903.	1904.
Coal mined	3,190,477	2,905,689
Exported from coast	948,909	838,298
Coke made	47,916	46,175

Exports have been affected by the Russian-Japanese war and by the rapid advance in the use of petroleum fuel in California. Local consumption has suffered from the installation of water-driven electric generators, but the utilization as domestic fuel is rapidly growing. All the coke is made in Pierce county.

The disastrous explosion that occurred at Burnett, Dec. 7, 1904, has been attributed, with certainty, to coal dust. From evidence given at the coroner's inquest, and from his own investigations, Mr. Owen concludes that a heavy blown-out shot created a thick dust, which formed with the liberated gases, an explosive mixture which was then ignited by a following shot.

Wyoming Mineral Production.

The report of Henry C. Beeler, State Geologist of Wyoming, covering the year 1904, has been received. The items for the last two years stand thus:

	1903.	1904.
Copper, lb	947,106	4,220,000
Gold	$3,600	$42,000
Silver, oz	200	10,500
Iron ore, l. tons	214,880	250,000
Coal, sh. tons	4,602,929	4,996,828

For the first time in its history, a majority of the copper mined in the State was also smelted there. Employees in coal mines numbered 9,177, an increase of 3,454 men over the number in 1903. The notable point last year was the increase of 3,272,895 lb. in copper. There was a gain of 393,899 tons, or 8.6%, in the coal output.

'Acid metal,' often called 'lead-bronze,' stands well the corrosive action of mine water, and is therefore suitable for parts of machinery employed underground. This alloy consists of 75% copper, 15% lead, 9.90% tin, and 0.10% phosphorus.

Mining and Forestry in the Black Hills.*

BY T. J. GRIER.

While the forests are of immense value to the mining industry, and for this reason the economical use of their timber is as earnestly sought by all far-seeing enterprises as by the governmental department entrusted with its enforcement, yet the mining industry itself has enough of public utility to entitle it to almost equal consideration, especially in view of the fact that a mineral deposit, once exhausted, can never again become a source of profit. Mines situated within the boundaries of a forest reserve, as is the case of the Homestake mine, labor under peculiarly trying restrictions, the repeal of which would not open the door to reckless waste of forest resources and would diminish the disadvantages that mining companies suffer, but from which transportation and irrigation corporations are now exempt. In one particular, fuel-needing industries in proximity to a reserve are of distinct advantage to the forests, to their own disadvantage. Regulations quite properly require the removal of all dead or infected timber, along with the sound, wherever logging operations are being carried on, but also demand the same price for it. The preparation of this stuff for fuel makes it cost nearly double the price of an equivalent supply of coal. This burden, falling equally upon all timber and fuel-using enterprises, could be relieved by giving the inferior wood gratis to whomever will remove it.

The government has heretofore generously granted rights of way, and permitted the construction of ditches across the public lands, but this policy has been completely reversed in regard to forest reserves. It is now impossible for any but irrigation and transportation companies to acquire a secure and permanent right of way through a forest reserve. It is true that, under the act of Feb. 15, 1901, the Secretary of the Interior may grant to a mining company a right of way for a water main, after due investigation, but it must be expressly understood that this is merely a permission or license, revokable at any time by the Secretary, or by his successors, and, what is most unjust, that the subsequent disposal, by the Government, of any tract through which the right of way passes, constitutes, without further act, a revocation of the permission so far as it affects that tract. It is plain that a mine's supply of water should not rest upon so insecure a basis. The simplest remedy would be a law giving to the miner the same rights as to the irrigation or railroad promoter, or, at least, the same security that he now enjoys on all other public lands.

*Abstract of an address to the American Forestry Association, Washington, Jan. 2, 1905, by T. J. Grier, Superintendent of the Homestake mine.

El Oro District, Mexico.

By Robert T. Hill.

El Oro, in equipment, possibilities and production, is the largest and most important gold-mining camp of Mexico. The camp is also interesting in its peculiar geological conditions; success therein is possible only with high expenditure, faith in geological laws and knowledge of their application, not to mention high engineering skill and technical administration. Notwithstanding this, there is but little literature concerning it; these notes are based upon brief observation in June, 1904, but are presented in the hope that they will lead to further investigation.

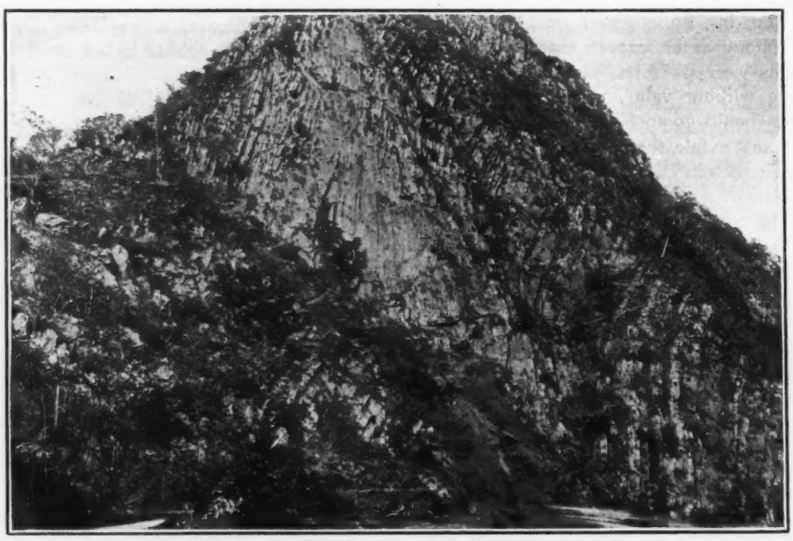
El Oro is not only interesting to the geologist, but also to the metallurgist, because of timely experimentation with advanced milling processes, being one of the first in America to introduce tube-mills on an extensive scale. The district is making steady output of gold, without reviving *antigua* ruins, or tunnel and drainage schemes. It is true that two years ago a boom was attempted, but fortunately it burst quickly, and to-day El Oro stands not for promoting, but for mining. The district is "no poor man's camp." The miner cannot, with pick and shovel, find veins. It is necessary to sink large, deep shafts, well-timbered, with hoisting engines and pumping machinery; which means organized capital.

El Oro is 90 miles northwest of the City of Mexico, and six miles west of the station of Tultenango on the old main-line (now the branch) of the Mexican National Railway. The boundary line, between the States of Mexico and Michoacan, runs through the camp, so that some of the properties are in one, and some in the other of the two States. Although the leading gold district of Mexico, the place is not usually even mentioned on most railway and commercial maps. A cut-off, incidental to the broadening of the gauge of the National, has now left El Oro on a branch line; but it is still accessible by the old narrow-gauge.

Topographically, El Oro is peculiar. It is situated on the northern slope of the great volcanic area that crosses and rises above the southern end of the structural plateau or table-land, from Orizaba on the east to Colima on the west. Almost due south about 50 miles is the great volcano Nevada de Toluca; and between it and El Oro is a variegated sea of rolling, timber-covered, constructional volcanic hills, *mesas*, peaks and monticules, alternating with basin-valleys and plains. The wooded hills, beneath which the veins occur, rise from 300 to 600 ft. above the savanna-like valleys which border them on the east and north. Although capped by volcanic lava and tuff, no relationship has as yet been traced between the lava and any known focus of eruption. The great Nevada de Toluca is the nearest conspicuous volcanic eminence; but it is probable that the igneous sheets of El Oro came from some nearer vent. The town of El Oro (altitude about 9,200 ft.) is on the eastern slope of a group of these lava-capped hills. To the west there is only from 300 to 500 ft. of rising ground. A long, but gentle, slope prevails to the east which makes 'tunnel' propositions from the latter direction impossible. La Somera, the highest of the hills, is 9,800 feet.

As one approaches from the plain to the east, he sees, against a background of timbered hills, a foreground of smoke-stacks, hoists, mill-houses, dumps and vast tailing-piles, extending for a mile in a NW-SE direction. Slightly lower down, and nearly in the center of the panorama, is the picturesque village of El Oro itself. Over the timbered hills, to the west, in a deep gulch, lies the Dos Estrellas mine, upon a second and parallel vein. Beyond it, is the ancient village of Talahualpa, which was the scene of rich production of silver in the eighteenth century from the Borde mines.

Geologically, the district is simple in some respects; in others, it is so perplexing that the writer has deferred this article because of uncertainty concerning the true explanation of certain phenomena. There are four rock-units in the geological structure, namely: (1) The basement country rock, consisting of calcareous shale, which may be termed El Oro formation proper, and which constitutes the matrix in which foreign mineral has been introduced as veins. (2) The great cap of andesite, which overlies and conceals the shale with its contained veins. (3) An older intrusive rock cutting the shales, and probably outcropping at



VERTICAL MESOZOIC FORMATION UNDER LAVA CAP.

the northern end of the district. (4) Quartz veins carrying the valuable ore.

The cap rock consists of one or more sheets, of gray-black andesite, having a thickness of from 150 to 500 ft. This material at surface, with decomposition, becomes black and brown. On fresh fracture it is, in places, massive, with small vesicles, and has a horizontally elongated flow-structure; while in other parts, there are beds of agglomerate, or volcanic tuff. The hardness of this cap-rock causes it to survive as the protective covering of the hills; but elsewhere, owing to its absence or removal, the valley tends to become constantly deepened. The rock overlies, unconformably, an old eroded topographic surface of the shale. It increases in thickness to the north from El Oro[1] shaft; at the San Patricio shaft, it is clear the cap-rock was laid down upon an unequal surface.

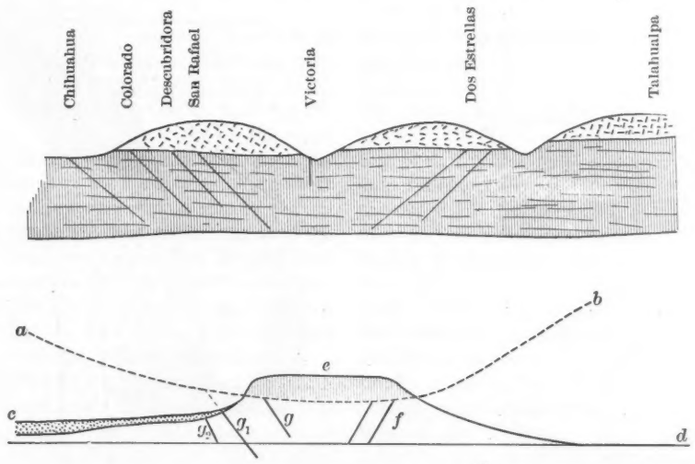


DIAGRAM SHOWING ORIGIN OF EL ORO GEOLOGIC CONDITIONS.

a. b.—Ancient valley filled by a lava flow. *c. d.*—New topography, with ancient hills, modern valleys and old lava streams hill tops. *g. g.*—Old veins preserved beneath cap rock. *g¹ g²*—Old veins, upper part destroyed by erosion.

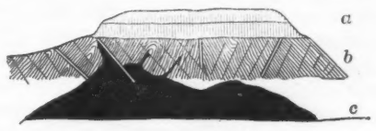
This rock sheet is an eruptive flow, but there are assertions which lead me to believe that, in addition to the cap-rock, there may also be sills and dikes of an old igneous rock protruding upward through the shale. It is alleged that, in the San Patros shaft, at the northern end of the district, the slates were encountered above the porphyry; the shaft is now down 250 m. in porphyry and has not as yet penetrated the still lower-lying shale.

El Oro formation is a thick calcareous shale, with thin beds of impure limestone, and constitutes a conspicuous member of the marine-sedimentary series of Mexico. It probably belongs below the thicker limestones of the Cretaceous, and includes rocks of Jurrassic and Lower-Cretaceous age. This formation commences in the north portion of the plateau near the Rio Grande in Chihuahua; it appears at intervals, with increasing exposure southward, until in the latitude of the State of Mexico, with much folding and complication, it constitutes the bulk of the sedimentary rock of the structural plateau supporting the mass of volcanic material piled above it.

The exposures of this formation are along the central axis and on all sides of the southern end of the plateau; it is conspicuous in the Malatrata scarp of the plateau, in the valley of the Balsas, and in the Sierra Madre del Sur. The formation encloses the lodes of many of the great mining districts of the Republic, along a narrow belt northward from Oaxaca through El Oro, Guanajuato, Comacho, and Parral. The coincidence is not set forth to convey the idea that these metamorphosed and folded ancient seamuds are of themselves mineral-bearing; but that their structure and composition may constitute conditions favorable for mineral deposition. In southern Mexico generally, the folds are almost vertical. The direction of the folds is that of the Mexican continental axis, N. 10° to 30° W. That this formation extends generally beneath the cap-rock at El Oro is proven by its contact on all sides of the outcrop and by numerous shafts and other openings.

There are some indications of igneous intrusives into the shale from below, which may prove to bear an important relation to mineralization. A hand specimen of this supposed intrusive shows a lighter-colored and more silicious igneous rock then the cap-rock, which is thickly speckled with unaltered pyrite. What is presumably this formation is but rarely encountered in the northern part of the workings of El Oro property, but it is frequently in the Esperanza; in fact, as will be shown later, the orebodies of the latter mine are largely contact material which may be, in part, an altered silicified product of this rock itself.

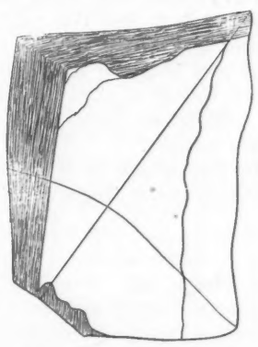
The mineral veins may be described as a series of parallel lodes of white quartz occupying fissures in the shale and contacts between the shale and the supposedly older igneous rock. These fissures are not always parallel to the lamination, but cut across it as shown in diagram. The lodes vary from stringers to lenticular quartz bodies more than 150 ft. wide. In places they widen, contract, or even subdivide and surround horses of the shale. The prevailing strike is N. 30° W., a direction which I have elsewhere described as the continental trend of the Mexican region, and which seems to prevail in many—I will not say most—of the big mines of Mexico.



THEORETICAL STRUCTURE AT EL ORO

a—Andesite cap rock.
b—Vertical shale (El Oro) formation.
c—Supposed ancient Igneous Intrusion.

There are several well-defined parallel veins in the district. As yet the system has not been completely explored; but the chief lodes are, beginning from the east:



FRAGMENT OF EL ORO SHALE.
Showing Veinlets Cutting Across the Lamination.

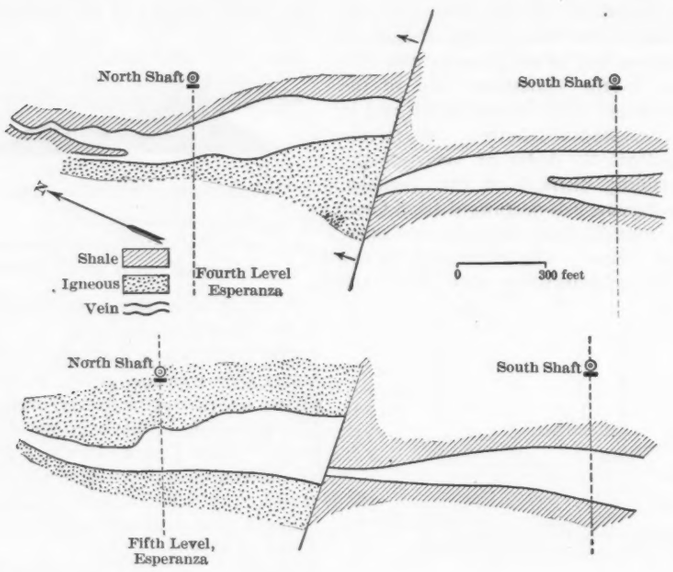
(1) Chihuahua, (2) San Acacia, (3) La Descubridora, (4) San Rafael, (5) The Victoria, (6) Dos Estrellas. Several smaller veins are known, the principal of which are: The small vein of Los Mondragones, on the hanging-wall of the Chihuahua; the Latera vein on the foot wall of La Descubridora; the Marameros on the hanging-wall side of the Descubridora; a stringer of San Rafael on the hanging-wall side of same. Three of the large veins are conspicuous and well explored, namely, La Descubridora, the San Rafael, and the Dos Estrellas.

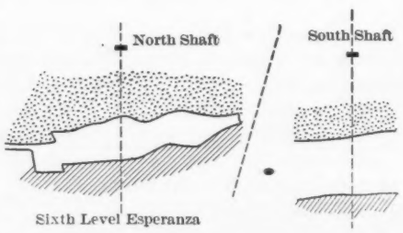
La Descubridora vein is the first of importance reached in going from east to west. It was extensively mined in times

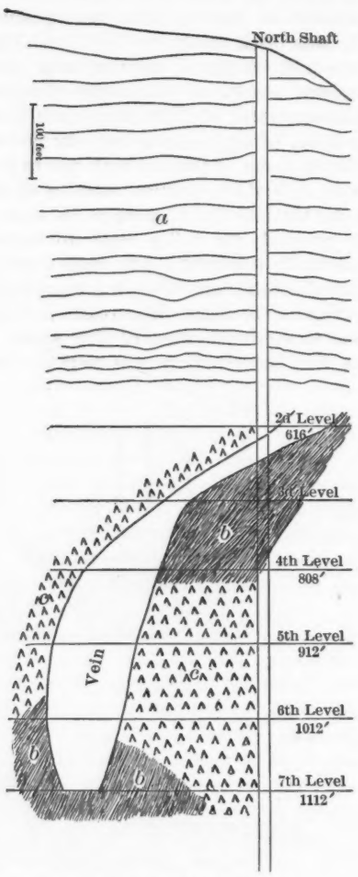
[1] As El Oro means "the" gold, it is considered correct to omit the article and speak for example of El Oro mine, and not the El Oro mine.—EDITOR.

past by former owners of El Oro mine, anl although for a time practically abandoned, it is now being re-opened. Old shafts are encountered all along its length, and many of the workings to the north have fallen in; but there are still some 3,000 ft. of old levels open. It was originally worked through the Providencia shaft, which was sunk to a depth of 700 ft. This vein is smaller than the San Rafael, its greatest width being only about six meters. It is said that originally it was richer, and even to this day fabulous accounts may be heard from actual eye-witnesses, but up to date, El Oro company's explorations have revealed only low-grade material.

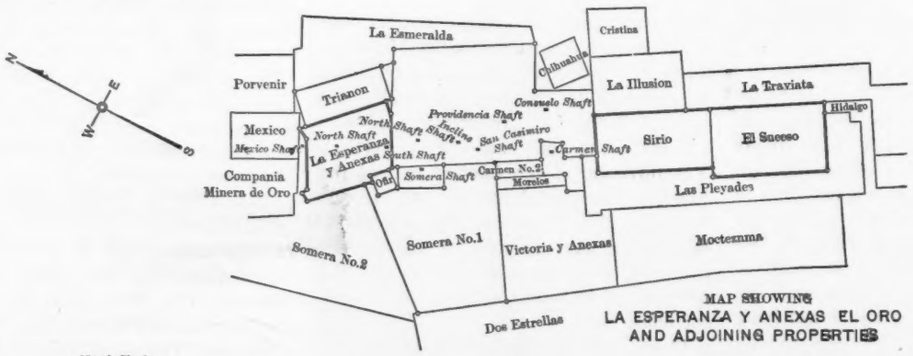
During the exploitation of La Descubridora a cross-cut was driven west from the Providencia shaft which led to the discovery beneath the lava cap of the San Rafael vein, which nowhere outcrops at the surface. It is now the chief vein of the district. An English engineer spoke of this lode in the following terms: "Quite throwing into the shade anything that has been found on the Rand, owing to its enormous width, and competing with West Australia in high values of the rich ore obtained in the streaks." Though



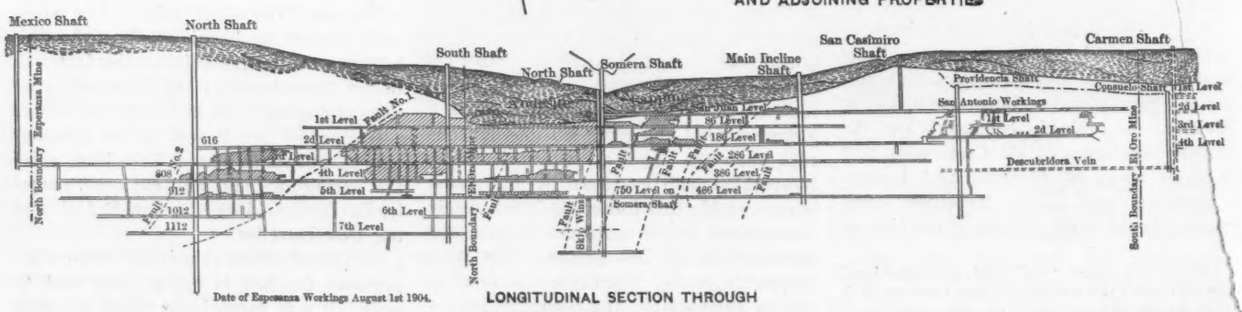




VERTICAL SECTION OF SAN RAFAEL VEIN.
a. Andesite Cap Rock. *b*. Shale.
c. Porphyry.



MAP SHOWING
LA ESPERANZA Y ANEXAS EL ORO
AND ADJOINING PROPERTIES



Date of Esperanza Workings August 1st 1904.

LONGITUDINAL SECTION THROUGH
LA ESPERANZA AND EL ORO MINES

this statement is extravagant, yet the work that has been done on the San Rafael, between the Carmen on the south and the Mexico on the north, by the Esperanza, El Oro, and Mexico companies, have already proved it to be of length and value. This lode is known to extend from El Carmen on the south, through El Oro and Esperanza properties to the Mexico on the north, a distance of a mile and a half. The dip is strongly westward. In the Carmen mine the vein divides into two branches, each having a width of about 16 ft., with about 200 ft. between the branches. Here appears to be a 'horse,' the two branched veins probably uniting in El Oro mine; the vein runs through the whole length of that mine, being about six meters wide at the south end, and 50 m. at the north, where it joins the Esperanza.

The vein in La Esperanza, where it is, in places, 150 ft. wide, carries a rich pay-streak on the hanging-wall about 26 ft. wide, and another streak 25 ft. from the last and about 10 ft. wide, of the same tenor. It continues northward from La Esperanza into the Mexico ground, where it has been encountered in the deep shaft with a width of over 70 ft. At first the quartz was low-grade; but recently rich ore has been encountered, with value practically all in gold, thus proving beyond a doubt that the San Rafael vein continues and carries its richness northward.

Dos Estrellas mine is situated beneath the western scarp of the cap-rock, and its product came from a lode which may be called the Dos Estrellas vein. The history of its discovery by Mr. Fournier is of interest. He found 'float' in an *arroyo* which led him to believe that, by driving an adit eastward beneath the cap, another large vein, like the San Rafael, would be encountered. His faith, backed by large expenditure, was well founded; and, as a result, the adit which he projected encountered a rich lode, and developed into one of the most profitable mines in Mexico.

Dos Estrellas vein is opened by an adit from the west side of the claim to the east limit of the same, a distance of 800 m., across the general strike. This 'tunnel' is in the slate at about 550 ft. below the collar, equivalent to the fourth level of La Esperanza. I regret that, owing to the absence of Mr. Fournier, I was unable to go underground. Authentic report, however, states that this lode dips east, being opposed to the westward-dipping San Rafael vein; prospecting had also demonstrated the continuity of the vein several hundred feet north of the present workings.

In the wide area between the Dos Estrellas and San Rafael veins, there is evidence of several intermediate parallel veins, some of them showing good ore.

In the early days, the gold found in the outcropping veins of La Descubridora (not covered with the cap) was coarse and free; in the present lava-capped veins, gold is found in fine, imperceptible particles. In El Oro mine, this occurs in a matrix of white, secondary quartz, which contains sulphide of silver. In La Esperanza, some of the ore has the aspect of being an alteration product of the adjacent igneous wall-rock. The ores of the San Rafael vein are oxidized, but it is rumored that, on the 700-ft. level of La Esperanza, unaltered sulphides have been encountered. The Dos Estrellas ore is more pyritic than that of the San Rafael, so far as one could judge from casual examination. The ratio of values ranges from 90 to 95 parts gold with 10 to 5 parts silver. In El Oro mine, a conservative estimate of ore reserves is over 500,000 tons of an average value of $10.73 per ton.

The geological structure of the district, though apparently simple, presents some complications which, while insignificant from a broad view, have important bearing upon the distribution of the ore. In general, the structure consists of a later cap of horizontal lava, overlying an old land surface; the sub-structure of this is composed of the vertically folded strata of shale, and of older igneous rocks intruded from below. Besides this, however, there has been faulting of a decisive character at different epochs; this has dislocated both the cap-rock and the sub-structure, playing havoc with the continuity of the lodes. I can present only partial evidence, gathered in the workings of the Esperanza mine, and illustrated in the accompanying diagrams.

About midway between the north and south shafts of the Esperanza, there is an east-west fault, down-throwing to the north, which cuts the cap-rock and sub-structure, and which completely severs and disjoints the vein and the country throughout the mine. Everywhere it throws the formation out of normal continuity, bringing different rocks opposite each other. This fault-plane is later than the formation of the mineral veins and is barren. These quartz mineral veins are older than the volcanic cap-rock and terminate abruptly with the shale at their contact with the overlying lava. Instead of being a simple, continuous fissure-vein, the San Rafael consists of a series of elongated lenses, swelling and pouching in length and depth, and disjointed in places by cross-faults. There is also a probability that, instead of a continuous vein or level, there are several lenses the ends of which overlap *en echelon;* for instance, the supposedly continuous vein, disjointed by faulting which is to be seen at the 4th and 5th levels of the Esperanza mine.

Regarding the origin of these gold-bearing veins one might turn to the hypothesis that the metals were deposited by descending solutions from the overlying cap-rock. Unfortunately, the exposures of the cap, where alteration would be evident, are but few. There is no alteration in the basement portion of the andesite to indicate that any part of its substance has been removed by circulation. The rock at its contact with the shale is usually firm, massive, ringing and impervious. Furthermore, its lower portion does not carry the gold to be expected. The mineral fissures end abruptly against the cap-rock. The facts, that the veins are oxidized below the cap, and that this oxidation may have occurred before the cap was formed, are also against this theory.

The best working hypothesis is as follows: Before the later volcanic flows, the region around El Oro was a tableland with rounded hills and valleys, underlain by intensely wrinkled, fissured stratification. Beneath this pleateau there were volcanic magmas, the roots of old volcanoes, the occurrence of which was intimately associated with mineralization, both through solutions penetrating the shale alone, and along the contact of the shale and older igneous rock. The lava flows constituting the present cap were originally in the depressions of a plain having a surface of shale. Erosion has converted the unprotected shale hills into valleys, and has left the old lava-filled valleys as hills. The old veins of the Chihuahua type, not covered by the lava, were thrown down and buried in débris, while those protected beneath the cap were preserved. The fissuring was that of a shear-zone which behaved differently in the different rocks. In general, its tendency was to produce a series of lenticular fractures. The present evidence seems to place the responsibility of the mineralization upon an older magma which lies irregularly below the shale, penetrating upward into it, in places, almost to the cap-rock. The fissures were formed, mineralized, oxidized and worn down before the out-pouring of the present lava cap.

Against the theory of solutions ascending from great depth, we are confronted with a remarkable condition in the San Rafael vein, where the rich orebody on the hanging-wall becomes poorer and smaller at a comparatively shallow depth. Unfortunately the evidence is not decisive at present.

An atmospheric cyclonic depression is another name for large areal barometric depression. An anti-cyclone is accompanied by high barometer over a wide region. These varying pressures assist or hinder the tide levels. In a recent case, the differences between high barometer at the center, and low barometer at the edges of an anti-cyclonic area, produced (or at least was accompanied by) a difference in sea-level of as much as three feet. This may also have been assisted by the action of winds.

Heat Recuperation and Waste-Heat Boilers.

A great deal of attention is now being devoted in American metallurgical and industrial practice, wherein high-temperature furnaces are employed, to the utilization of waste heat for the generation of steam. This is in no way a new idea. It was carried out at the zinc smelter at Auby, France, about 30 years ago, and perhaps may have been tried elsewhere at an earlier date. In the United States the practice has been exemplified on a large scale at the smelter of the Matthiessen & Hegeler Zinc Company at Lasalle, Ill., for at least seven years, and for a shorter period at the Washoe smelter at Anaconda, Montana, and at the De Lamar copper refinery at Carteret, N. J. The success of these installations has led to a general investigation of the subject and its contemplated application in several new plants, so the practice bids fair to become one of general adoption wherever the conditions are favorable.

Irrespective of the wastes of fuel that are suffered in connection with the fireplace—that is, unburned coal discharged with the ashes and the losses attendant upon the use of a deficiency or excess of air—the chief sources of loss in furnace work are the heat which is radiated from the masonry and the heat which is carried away by the gases discharged into the chimney. The loss of heat by radiation can never be entirely prevented, but it can be materially diminished by increasing the thickness of the furnace walls, and by reducing the ratio between the hearth area and the superficial outside area, which is possible in many kinds of furnace, and in general is a result of increase in the hearth dimensions. Nor is it possible to prevent entirely loss of heat in the chimney gases, because they must possess a certain amount of heat in order to create the draft necessary for the operation of the furnace. It is not necessary, however, to consume a great quantity of heat for this purpose, since the draft of a chimney is at its maximum at a temperature of 273° C. (523° F.) above that of the external air, and there is no significant increase over a temperature difference of 200° C. (392° F.). All direct loss of heat in the chimney gases could be prevented by cooling the gases to the temperature of the external air and restoring their caloric to the furnace, but this would involve very expensive means of heat recuperation and the draft would then have to be created mechanically, which would in turn involve the use of heat in generation of the power, although not so much as the chimney alone would require.

In furnaces wherein certain work is supposed to be done uniformly throughout the laboratory of the furnace, as in the zinc smelting and reverberatory copper smelting furnace, differing from the progressive action in the roasting furnace, the products of combustion must leave the furnace at substantially the minimum temperature that must be maintained in the furnace, this temperature being 1,200°, 1,300°, or even 1,400° C., as the case may be. This condition is manifested in the great volume of flames often discharged by chimneys 50 or 60 ft. in height, showing that even at that remote point the temperature is sufficiently high to cause unconsumed carbon monoxide to burn. In the Siemens regenerative furnace this great waste of heat is obviated by conducting the hot gases through brick checker-work, to which they give up a large part of their heat, such heat being subsequently taken up by a reversed current of air and restored to the furnace, the practical result being that the gases finally escaping to the chimney have a temperature of only 300° C., or thereabout. The economy of the Siemens furnace in this way, combined with the advantages of gas-firing and the use of highly preheated air for the secondary combustion, is ordinarily very great. The Siemens furnace has never yet, however, found any general application in the United States in metallurgical work, outside of iron and steel, and in this respect there is a wide difference between American and European practice.

The reason for this difference was primarily the very high cost of a gas-fired regenerative furnace as compared with a a direct-fired non-regenerative furnace and the relatively low value of coal in many of the American metallurgical districts. In many cases it was really more profitable to burn coal wastefully than to burn it economically, taking all things into consideration. Latterly, the enormous increase in the size of some of our furnaces, far exceeding anything that is known in Europe, would have introduced new conditions into the application of the Siemens system, which have not yet been practically worked out, and perhaps never will be, in view of the present tendency toward the recuperation of heat in the form of steam.

The revival of this old idea may be traced to the modern development in metallurgical practice of a very large power requirement. In recuperating heat in the form of steam, it cannot, of course, be restored to the furnace wherein originally generated, but must be employed for some other useful purpose. If there be no such purpose available, there would obviously be no saving in generating a large quantity of steam which could not be used. Formerly, the average metallurgical plant, referring only to copper, lead and zinc smelting, did not require a large amount of power. Even at the present time the smelting furnaces of zinc works would be capable of generating an enormous excess of power over what is required for the ordinary purposes of smelting. If, however, sheet-zinc rolling be practiced in connection with the zinc smelting, as at Lasalle, there is use for large power. Similarly in copper smelting, the operation of the large modern blast furnaces with a high pressure of air, the operation of the converters and all the modern mechanical accessories, require large power and afford a use for steam generated from the waste heat of reverberatory furnaces. The electrolytic refinery requires a large power and makes it rational to attach waste-heat boilers to the furnaces for smelting anodes and cathodes.

Assuming that there be such a use for power, the waste-heat boiler is obviously a very efficient means for recuperating heat. With respect to the temperature of the gases finally discharged into the chimney, it can be made to compare very favorably with the Siemens furnace. Distinctly in its favor, on the other hand, is the first cost of installation. Instead of the extremely costly regenerative chambers and other details of furnace construction, there are required simply the boilers, which must be provided anyway for the purposes of the plant. It is only necessary to arrange them so that they will not interfere with the draft, or any of the other conditions that must be maintained in the furnace to which they are attached. That such an arrangement is feasible and successful is manifested by the examples from practice, which have previously been mentioned.

The installation of waste-heat boilers that has attracted most attention is that which has been made at the Washoe works of the Amalgamated Copper Company. The grates of the new 102-ft. furnaces, which smelt an average of 275 tons of ore per 24 hours, are 7 by 16 ft. The consumption of coal on the grates is 58 tons per 24 hours, showing an average rate of combustion of about 43 lb. per square foot per hour. The droppings from the grates are jigged, about 6.6 tons of useful coal being recovered daily in that way. Attached to each furnace are two water-tube boilers, which furnish an average of 600 h.p. We are uninformed as to the evaporative power of the coal employed at these works, but assuming 7.5 lb. of water per pound of coal, the development of 600 h.p. per 24 hours would require about 29 tons of coal if employed directly. This would imply a saving of 50% of the coal used in firing these furnaces, disregarding what is recovered from the ashes.

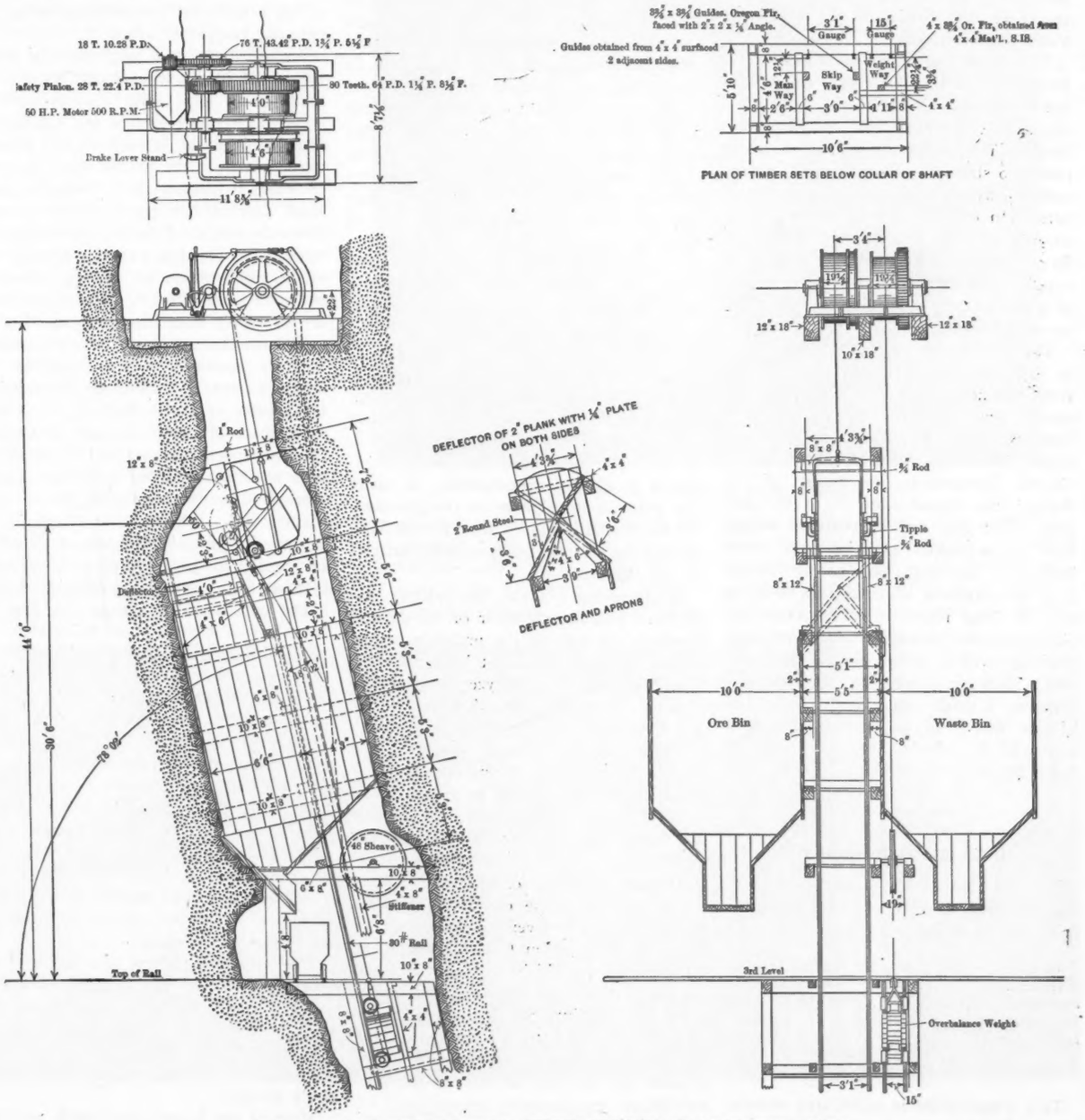
Attention is now being directed to the attachment of waste-heat boilers to the rotary kilns used in the cement industry. It is well known to every one acquainted with the cement business that the fuel bill is one of the largest items in the manufacturing cost. Mr. A. B. Helbig, superintendent of the German-American

Portland Cement Works, Lasalle, Ill., has recently written a very exhaustive paper, published in the *Engineering News*, Feb. 16, 1905, to prove that the waste-heat boiler alone solves conclusively the fuel problem of the cement mill. He admits that the successful solution of the problem may not be easy, but solved it will be nevertheless, and a saving of 50 to 60% in the fuel bill is to be expected therefrom. Mr. Helbig has made some very exhaustive calculations as to the physics and mechanics of this problem, and his paper will be a valuable reference for all who are interested in this subject, whether from the cement manufacturing or metallurgical standpoint.

An Underground Skip-hoisting Plant.

By S. A. Worcester.

The plant shown in the accompanying drawing is one which I designed for the Camp Bird gold mine, Ouray, Colorado, for hoisting ore and waste from a total depth of 900 ft. It is a rather unusual arrangement, the hoist being placed on a part of the iron frame of the hoist. The overbalance weight is a feature seldom seen in mine hoisting plants, and is used to good advantage with three different hoisting plants at the Camp Bird mines. It gives extreme economy of power, and



ARRANGEMENT FOR HOISTING UNDERGROUND AT CAMP BIRD MINE.

strong timbers which span the stope, while the two ropes, the hoisting rope and the rope for the overbalance weight, pass down through the frame of the hoist. No head-frame nor overhead sheaves are used. As there is no foundation directly beneath the drums, the post-brake is supported by a cast-iron cross-beam, forming in this particular hoist it makes the peak of the load as small as possible, which is an important desideratum. The overbalance weight is made to balance the skip, plus one-half of the average load of ore as nearly as it can be calculated, so that about the same current is used for lowering the skip empty as for hoisting it

loaded. The running of these balanced hoists is much smoother, and the wear and strain on the brake much lighter, than is the case with the ordinary unbalanced hoist; while the economy of power is evident, as there is absolutely no dead weight hoisted. The motor required is, of course, much smaller than for the unbalanced hoist. The overweight drum of this skip hoist is made smaller than the skip drum, so that the weight need never travel to the bottom of the shaft, nor above the third level.

The pinion driving the main gear on the drum shaft is annular, and is gripped between two rawhide surfaces, so that if the skip encounters any obstruction in hoisting, the undue strain will cause the pinion to slip between its gripping flanges and thus avoid breakage of any important parts. In order to dump the skip in as narrow a space as possible, a tipple of forged steel is used, and is journaled at a point considerably above its rails, and at a point nearly coinciding with the center of gravity of the loaded skip.

The skip dumps its contents on a door, or deflector, which is operated by ropes from the hoist floor so as to direct the ore or waste into the proper bin. The bins discharge into cars on the third, or tunnel, level and the cars are hauled by electric locomotives, in trains of 15, through the tunnel 2,200 ft. to the surface. The skip and overbalance weight have waste-packed axle bearings, brass bushed, in long cast-iron sleeves, forming large oil-chambers, which require re-filling only at long intervals. The axles are plain, straight pieces of cold-rolled steel shafting, with a cotter pin in each end, and a short pin driven into the axle, and engaging a small recess in the outer hub of one wheel, so as to make the axle turn with the wheel. The speed of hoisting is 600 ft. per minute.

Gold in Dutch Guiana.

The gold output of Dutch Guiana during the year 1904 is reported from official sources as follows:

District.	Grams.	Value.
Surinam	294,235	$195,519
Saramacca	142,832	94,912
Marowijne	121,834	80,959
Lawa	223,961	148,822
Totals	782,862	$520,212

This is equivalent to 25,169 troy ounces, Dutch official returns being stated as fine gold.

Aluminum is a difficult metal to tool, as it clogs the cutter. It also shows a tendency to split and check on bending. Some of its alloys, as that with magnesium and called 'magnalium,' are said to be easily workable.

The Making of By-Product Coke.*

By Edwin A. Moore.

The value of the combustion products that are wasted by the beehive oven is estimated at between 80c. and $1 per ton of coal coked, and the amount of coal annually treated in the United States, in ovens of this type, approximates 30,000,000 tons. In view of this tremendous waste, it is surprising that the adoption of by-product ovens in this country has been so long delayed. In Germany, not a single beehive oven remains, and in England they have nearly all been replaced. In this country and Canada, 3,950 by-product ovens have been built within the last four years, of which 2,605 are of the Otto-Hoffman and United-Otto types, coking 15,000 tons of coal a day, and the remainder, of the Semet-Solvay type, treating 8,000 tons; or altogether, a total of 8,400,000 tons a year.

The largest plants yet installed have been situated near cities, notably Boston and Baltimore, in order to assure a convenient market for the gaseous products, the coke, tar and ammonia being considered as of secondary importance. A large plant at Sydney, Cape Breton, supplies coke for the blast furnaces and gas for the open-hearth furnaces of the Dominion Iron and Steel Company. Ammonia is usually concentrated, or made into ammonium-sulphate on the premises, but tar is usually sold to other parties, who extract the oils and make roofing material of the residue.

In designing a plant, the relative importance and the character of the desired products, as well as the probable nature of the raw material, must be considered. The best coal will analyze around 28% volatile and 72% fixed carbon and below 1.25% sulphur. If a strong coke is desired, as for blast-furnace use, the coal cannot be too fine. Sometimes two or three grades of coal may be mixed, so as to combine the valuable qualities of them all. A coal of the above composition should yield per ton: 1,460 lb. coke, 9,500 cu. ft. gas, 10 gal. tar and 5 lb. ammonia.

An idea as to the operation of these ovens can best be given by describing the plant of the Camden Coke Company, at Camden, N. J., which has been at work for two years. Its object was to supply coke for metallurgical, foundry and domestic uses, to provide illumination for Camden, Trenton and intermediate towns, to save the tar and to recover the ammonia.

Coal is brought in barges alongside the dock. A traveling crane, of 100 tons per hour capacity, can unload, by a clam-shell bucket, from any point along the wharf and deliver to a stock pile, or into coal bins, either directly, or indirectly through crushing rolls. The bins, Berquist suspension, can hold 1,800 tons, a supply for 3½ days. They surmount one end of a trestle, which in turn spans the length of the batteries. This trestle is arranged to convey a 6.25-ton larry which has six discharge hoppers in its under side, corresponding in position to the six feeding openings in the top of each oven.

An oven is 17 in. wide, 6.5 ft. high and 33 ft. long, is built of German fire-brick and is closed by iron doors at each end. The ovens are grouped into two batteries of 50, a series of vertical flues being left between every two ovens.

Arched flues run longitudinally under the whole length of each battery, two of them being filled with checker-work to serve as regenerators. A combustion chamber is placed below each end of each oven, but over the arched flues, to each of which it connects by a dampered port. Heat from the burners passes up and down the vertical flues, and escapes to the stack, after having passed through one of the regenerators, and having lost about 600° of its temperature. The direction of the air-supply circulation is reversed every half hour, according to the well-known Siemens principle, a fan supplying the motive power. The feed air is heated in two stages, first to 800° F., by being drawn back and forth through flues which pass through the heated part of the structure, and then to about 1,700° by passing through one of the regenerators. The fuel gas has a heating value of 550 B. t. u. per cu. ft., and about 6,000 cu. ft. of it are needed for each ton of coal, the temperature in the oven being raised to 2,700°.

The gas liberated during the first 12 hours is rich in illuminants, being about 16 c.p., and having a fuel value of 650 B. t. u. The succeeding gases are less rich and are led into a separate main. At the end of 24 or 30 hours from the time of charging an oven, the end doors are raised and the coke is pushed out mechanically through the oven on to an elevated concrete platform, where it is cooled by a hose. It is then loaded into cars at the opposite edge of the platform, or, if it is to be broken, is dropped through holes to a conveyor, which elevates it to crusher and screens. The fine from the screens is used as boiler fuel at the plant.

The volatile products are collected in large mains, which run longitudinally, one on each side of the battery, and above the ends of the ovens. Rich gas is collected in one, and poor gas in the other; their subsequent treatments are parallel, but entirely distinct.

Most of the heavy constituents are deposited in these mains, a constant stream of tar being flushed through to collect them. The gases are led through air-coolers, then through water-coolers, finally through tar-scrubbers, and from these they pass to the exhausters that have aided their progress up to this point, and by which they are compressed to 17 in. water-gauge tension. They next go through tar-ex-

*Abstract of an address to the Philadelphia Foundrymen's Association, Feb. 1, 1905.

tractors, in which the last traces of tarry and oily constituents are removed. This cooling and condensing process must be gradual, because a sudden drop in temperature induces the formation of naphthalene.

Ammonia is collected, to the best advantage, at a temperature of 70° F. The gas is brought into contact with water by passing in succession through two washers. Only the second one receives fresh water, its overflow being used as the feed for the first washer, in which most of the ammonia is recovered. The product of this first washer thus reaches a strength of between 1 and 2 per cent.

The poor gas will be used in the oven burners. Its illuminating ingredients, therefore, not having any utility, are removed by washing with tar oil, which has a strong affinity for benzole, after which this poor gas is stored for burning at the ovens. The solution of benzole in tar oil is then heated by steam in a retort. The benzole is liberated by this treatment, and joins a part of the rich gas which has been deflected from its course between the ammonia-washer and the storage tank. By this unique method of enriching the rich gas at the expense of the poor, nearly the whole illuminating content of the coal is confined to that portion of the product that is to be used for lighting or for mixture with water-gas.

Tar, when collected from various mains, traps and scrubbers, is sold to outside parties. The ammonia solutions are distilled in steam-heated retorts, lime being added to displace the last traces of the gas; this is then condensed and absorbed by water so as to make an 18% solution, which is then marketable.

Carborundum fire-sand, specific gravity, 2.7, granular and easily crushed, mixed with sodium silicate as a binder, makes an admirable lining for melting furnaces.

The Quicksilver Deposits of Huitzuco.

By Frank D. Pagliucci.

Quicksilver is found in many parts of Mexico, in veinlets and irregular deposits, usually in limestones. Among these numerous deposits that of Huitzuco, in the State of Guerrero, is not only one of the most successful mines, but its ores are almost unique, consisting, below the weathered zone, of the rare mineral livingstonite, the sulphantimonide of mercury. These deposits are situated about three-quarters of a mile from Huitzuco, a small town south of the City of Mexico, and about 21 miles east of Iguala, on the Cuernavaca & Pacific branch of the Mexican Central Railway.

HOT SPRING DEPOSIT AT HUITZUCO.

The deposits occur in a number of low, rounded hillocks rising some 300 ft. above the town, and 3,500 ft. above sea-level. This altitude gives perpetual spring. The quicksilver deposits are of recent discovery, having been found by an Indian in 1874, and located by an engineer the same year. The rich bonanzas near the surface were actively worked for six years, and the earlier clay and iron retorts replaced by ovens of the Spanish Almaden pattern. Later this property went into the hands of a Frenchman, and passed through various vicissitudes, in which great bonanza bodies of livingstonite were discovered.

HUITZUCO QUICKSILVER MINE.

The Huitzuco mines lie in the center of a richly mineralized region underlain by Cretaceous limestones, forming rounded hills, on which hot-spring deposits appear. Serpentine, slate and granite are near-by, as shown by the river drift. The mines comprise a group of 20 or more workings, most of them on the summits of small mounds. The most interesting of

these deposits is that of the Trinidad and La Cruz mines, which have been the chief producers. They are situated on a small hill, separated from the ranges of low hills, in which the other mines occur, by a narrow valley. These hills are covered by bushes, particularly the thorny catsclaw.

The deposit consists, near the surface, of earthy ore, a sandy clay-like filling of crevices of varying width and depth, radiating somewhat irregularly from the old hot-spring vent or pipe. These ores are mostly low-grade. In La Cruz this ore was replaced, at a depth of 130 ft., by a deposit of livingstonite, apparently forming a vein. This mineral, the peculiar and characteristic ore mineral of the locality, consists of: Mercury, 14%; antimony, 53.2%; iron, 3.5%; sulphur, 29.08%. As will be seen, it is a valuable ore of antimony as well as of quicksilver, though only the latter mineral has been saved.

The developments at La Cruz show that the workings follow down an old hot-spring conduit or geyser pipe, whose deposits form a mound, shattered by the earthquakes common to the region, the fractures being filled by the earthy ores (*tierras*) after the decadence of the spring. The main ore-shoot of the vein has been mined to a depth of 500 ft. It averages about 3 ft. thick, 10 to 20 ft. long, but varies up to 6 ft., or even more, in thickness and 50 ft. in length. The mine is dry, or nearly so, the little water encountered being pumped into the old hot-spring pipe, where it disappears. The new shaft is now 700 ft. deep. The ore all occurs in limestone, associated with gypsum and native sulphur as gangue minerals. The ore forms pockets and bunches, with layers (*mantos*), but is mostly in an irregular net-work of small veinlets in the limestone forming a stockwerk. The limestone forming the immediate walls of the deposit is lighter colored and more granular than the rock found farther away.

No bonanzas were encountered below 460 ft., and though the ore-bearing zone at that depth had a width of 200 to 300 ft., it was low-grade (0.3 to 0.7%), and was not worked in March, 1903, the time of my visit. The shaft was then 700 ft. deep, lined with masonry, and provided with a 60-h.p. steam hoist. Crosscut tunnels show the mass of the hill to be formed of black, Cretaceous limestone.

The mine laborers are paid by contract, the scale being graded according to the value of the ore and difficulty of extraction. The average amount earned is $1 per day.

Arsenic has a most richly varied chemistry. It can be oxidized or reduced, in several stages, and in wet solutions or dry fusion. In view of this, it is very annoying that its compounds are generally poisonous.

Crushing and Cyanidation.

By F. C. Roberts.

A cyanide annex to the stamp-mill treating gold ore often increases the crushing capacity of the plant. That is to say, when using a coarse screen, in order to promote rapid discharge and thus obtain the maximum duty, those particles of gold which are not caught by the mercury may be subsequently, and in part, recovered in the cyanide plant. Recent experiments, made at a mine where such considerations were important, yielded some interesting results, which demonstrated, in this instance, that classification, combined with re-crushing, was the most economical method of obtaining both the maximum crushing duty and also high extraction. The width of vein, lateral continuity, and working conditions generally, made it possible to develop and extract ore, with a rapidity sufficient to support a reduction plant with a capacity of 1,500 tons monthly.

The expenditure necessary for the purchase and erection of a 10-stamp mill was obviously all that the conditions warranted; it was observed, however, that if the crushing were so adjusted as to obtain a duty of five tons per stamp per day, or 1,500 tons per month, without subsequent treatment, a large loss would occur in the discharged tailing; on the other hand, if such a modification were effected in the operation of the mill as to induce fine crushing and a corresponding increase in extraction by amalgamation, the tonnage would be so largely decreased as to produce an abnormal rise in the working expenditure, and the margin of profit would be inadequate to the amount of capital involved, as the following estimate shows:

At 1,500 tons per month: Value of ore per ton, $17; extracted by amalgamation (experiment VI), $13; extracted by cyanidation (experiment I), $2.38; total extraction, $15.38; working cost per ton, including mining and milling, $8.40; cyanidation (per ton crushed), $1.04; total cost, $9.44; net profit per ton, $5.94.

At 900 tons per month: Value of ore per ton, $17; extracted by amalgamation (experiments IV and VI), $15.43; working expenditure upon basis of above figures, excluding cyanidation, $14; net profit per ton, $1.43.

In the 1,500-ton estimate, the 'sand' (experiment VI) made 54.1%, carrying $5.75 per ton; 'fine sand' made 18.6%, carrying a value of $1.50 per ton; the slime was discarded; the cyanidation extraction was $2.38 per ton crushed, or 70.5%, as compared with $3.28 per ton treated, from a $4.66 product.

It would be possible, of course, to double the number of stamps, and thus bring the monthly capacity up to 1,500 tons; but it is obvious that, in so doing, the initial cost of the additional 10 stamps, together with a proportional increase in the boiler and power equipment, would far exceed the purchase and erection of a cyanide plant of sufficient capacity to deal with the leachable product of 10 stamps, when crushing 1,500 tons per month.

Having determined that the tailing would require further treatment, a preliminary examination suggested cyanidation. The first determinations made were with reference to the applicability of this treatment. The results obtained in experiment (I) demonstrated that the product was amenable to cyanidation; and it was also shown that under the conditions of treatment observed, extraction by cyanidation would be proportional to the fineness of the material treated. (See classification of residue.) It was also made manifest by this classification that the higher value in residual gold was contained in the coarse sand.

These points being established, the next step was to determine what results in weight and value would follow a classification of the product into sand, slime and concentrate. It is seen (experiment II) that about 21% of the total value was left in the tailing after amalgamation, of which 10.7% was contained in the sand, and 6.9% in the coarse cencentrate. The concentrate was produced by a method analogous to that of spitzlutten, and not more than one-tenth was clean sulphide. It was therefore concluded that some gold was associated with the coarse sand and the accompanying concentrate. The slime, which in this case represented 32% by weight of the total tonnage and only 2.58% of the total value of the ore, was considered too low to be treated.

The next experiment (III) was a simple classification of the combined product (sand and slime) obtained from experiment II, and was made with an object of determining whether, with one classification, after amalgamation, it would be possible to discard a portion of the product without further treatment. The tailing was passed over a 90-mesh screen; and it was found that 43% of the product, which remained upon the screen, contained 68.4% of the total gold, while 57%, which passed the screen, contained but 32.1 per cent.

Experiment IV corroborates the points established in experiment III. The finer screen, 25-mesh, produced a substantial diminution of slime. The value of the clean concentrate is seen to be high, but the percentage in weight is low, so that it represents but 7.9% of the total value of the ore.

By comparing experiment IV with experiment II, it is seen that, in the latter, the coarse concentrate represents 6.9% of the total value of the ore; while, in the former, the clean concentrate represents 7.94%. These results are harmonious, and

support the view that the coarse concentrate of experiment II is made up of 90% of sand valued at $2.50 per ton, and 10% of clean concentrate valued at $135 per ton.

Experiment V was performed with the idea of demonstrating a point which was naturally surmised, namely, that extraction by amalgamation would be proportional to fineness of crushing. In treating the tailing after amalgamation it was found that 96% was low grade, while the higher value was easily traced to 4% of the product. There was also evidence in favor of the view that this 'dirty' concentrate had been reduced in weight, with a corresponding increase in value; that is to say, 1% of clean concentrate valued at $40 per ton had been recovered.

Experiment VI was carried out, partially for confirmation, but also with the idea of obtaining a part of the tailing as a relatively coarse, high-grade product, and to show that this coarse product was actually reduced in value by finer crushing, followed by amalgamation. The coarse sand, value $5.75 per ton, was reduced in value by re-crushing and further amalgamation, to $1.25 per ton, equal to an extraction of 78.2 per cent.

With these data, attention was directed to a combination of two methods: (1) Cyanidation, and (2) classification, re-crushing and extended amalgamation. A summary showed that, according to experiment VI, by amalgamation, $13 (76.47%) of the total value was obtained. The tailing was worth $4 per ton, made up as follows: 27% slime, worth $1.50 per ton; 18.6% fine sand, worth $1.50 per ton; and 54.1% coarse sand, worth $5.75 per ton. The slime need not be considered. The leachable product, therefore, was made up of about 72.7%, worth $4.66 per ton; or, on a basis of 1,500 tons crushed per month, 1,090 tons, worth $4.66 per ton. From experiment I, it is recalled that an extraction of 70.5% was obtained from a product worth $5.75. This extraction could have been improved, but it was obvious that this was not the treatment to apply. Assuming, therefore, that this extraction would have been obtained from a $4.66 product, the value of the recovery would be $3.28 per ton treated.

The life of the mine may be assumed as ten years. The estimated expenditure, incurred in the purchase and erection of a cyanide plant capable of dealing with 1,090 tons of sand per month, is placed at $15,000. Therefore, assuming a rate of 7% compound interest, at the termination of the life of the mine the capital involved would be $29,369 on a basis of 1,090 tons treated per month, at 22c. per ton. The working cost per ton upon this basis was estimated at $1.44, plus amortization, or $1.66 per ton. Thus the total net value per ton on the operation would have been $1.62, or $1,765 per month.

Again referring to experiment VI, let one assume, with the plan to re-crush, that only 54.1% (811.5 tons) was really worthy of consideration; the value of this product is $5.75 per ton. Now 78.3% (or $4.50 of this value) is recoverable by re-crushing. The estimated cost of a plant capable of reducing 811.5 tons of sand per month to the necessary fineness is placed at $5,150. The capital involved, assuming the quoted rate of interest, etc., would be $10,130, or $0.10 per ton. The additional working expense of operating this re-crushing plant was estimated at $0.32 per ton, plus amortization; a total cost of $0.42 per ton. Hence the total net value of the product under these conditions would have been $4.08, or a net profit per month of $3,310; this is nearly double what would have been returned by the introduction of a cyanide plant. If the first cost of cyanide and supplies, and other factors, were more favorable to cyanidation than in this instance, it is admitted that the estimated profit would not be so conclusive.

Experiment I: On coarse sand (including concentrate mentioned in experiment V); original value, $5.75 per ton; period of treatment by KCy, four days; residue after treatment contained $1.70 per ton; proportion passing 60-mesh screen, 57%, with a value of $1 per ton; proportion remaining on 60-mesh screen, 43%, with a value of $2.88 per ton; consumption of KCy, 0.73 lb. per ton; total extraction, 70.5 per cent.

Experiment II: Coarse crushing; original value of ore, $15.50; crushing screen 26-mesh; extracted by amalgamation, $12.25 ratio to total value in ore, 79.03%; proportion of slime, 32%; value of slime, $1.25 (or per ton milled $0.40), ratio to total value of ore, 2.58%; proportion of sand, 60.5%; value of sand, $2.75 (or per ton milled $1.65), ratio to total value of ore, 10.7%; proportion of coarse concentrate, 6.6%; value of concentrate, $16 (or per ton milled, $1.06), ratio to total value of ore, 6.9%; total value accounted for, 99.21 per cent.

Experiment III: Tailing; original value of tailing, $3.11; proportion passing 90-mesh screen, 57%; value of undersize, $1.75 (or per ton milled, $1), ratio to total value of ore, 32.1%; proportion remaining on 90-mesh screen (including all of the concentrate), 43%; value of oversize, $5 (or per ton milled, $2.15), ratio to total value, 68.4%; total value accounted for, 100.5%. Note that this tailing (from experiment II) was classified by wet sizing.

Experiment IV: Coarse crushing, concentration, etc.; original value of ore, $17; crushing screen, 25-mesh; extracted by amalgamation, $13.10, ratio to total value of ore, 77.05%; wet-classification of tailing, proportion of slime, 23%; value of slime, $1.50 (or per ton milled, $0.35), ratio to total value of ore, 2.06%; proportion of sand, 75%; value of sand, $2.50 (or per ton milled, $1.87), ratio to total value of ore, 11%; proportion of clean concentrate, 1%; value of concentrate, $135 (or per ton milled, $1.35), ratio to total value of ore, 7.94%; total value accounted for, 98.05 per cent.

Experiment V: Fine crushing; original value of ore, $16.20; crushing screen, 120-mesh; extracted by amalgamation, $14.20, ratio to total value of ore, 87.6%; wet-classification of tailing, proportion of slime and fine sand, 96%; value of this product, $1.25 (or per ton milled, $1.20), ratio to total value of ore, 7.4%; proportion of sandy concentrate, 4%; value of concentrate, $10 (or per ton milled, $0.40), ratio to total value of ore, 2.46%; total value accounted for, 97.46 per cent.

Experiment VI: Coarse and fine crushing; original value of ore, $17; screen used in crushing, 23-mesh; extracted by amalgamation, $13; ratio to total value of ore, 76%; wet-classification proportion of slime, 27%; value of slime, $1.50; ratio to total value of ore, 2.41%; proportion of fine sand, 18.6%; value of sand, $1.50, ratio to total value of ore, 1.64%; proportion of coarse sand, including concentrate, 54.1%; value of coarse sand, $5.75 (value of ore after 120-mesh crushing, followed by amalgamation, $1.25), (percentage additional extraction due to extra crushing, 14.2%), ratio to total value of ore, 18.29%; total value accounted for, 98.81 per cent.

Mine Explosions in Kansas.

The legislature of Kansas, now in session at Topeka, has passed a bill authorizing the appointment of a commission to investigate and report on the causes of mine explosions in the Pittsburg coalfield in that State. The moving cause for this action is the fact that there have been recently a number of explosions of gas—possibly of dust—in that field. Some loss of life and considerable damage to property have resulted, and the question has arisen whether the Kansas mines are properly safeguarded against danger from this cause. The commission will examine into the causes and propose remedies.

Governor Hoch has appointed the following as members of the commission: J. A. Orr, Weir City, State coal mine inspector; Archie Fulton, Lansing, inspector of State mine; Edward Barton, professor of organic chemistry in the University of Kansas. It will be noticed that the operators are not represented on this commission. They have asked to have such representation, and it is probable that two members will be added to the commission at their request.

Ocean currents are developed and maintained, largely, by differences in heat. But, while it was formerly supposed that the chief seat of the effective motive power was in the ocean water itself, it is now known that the atmospheric currents are the real agents. These air currents are, of course, convection currents, caused mainly by difference in temperature.

The Chemistry and Metallurgy of Copper.—V.

By Chas. S. Palmer.

No subject connected with the general theory of slag calculation has received so much attention with such meager results, as the old riddle of the acid or basic rôle of alumina. The topic is fascinating. It is connected with the general theory of chemistry, and with the fundamental conception of what is meant by an acid and a base. We are also greatly hampered by the difficulty, to which repeated reference has been made, namely, our ignorance regarding the chemical conditions of the field of fusion.

In the first place, let us see how alumina conducts itself in water solution. It takes only a glance at the list of reactions given in any standard qualitative analysis, to observe that, no matter what the reagent—whether the alkaline hydroxides, or sulphides, or carbonates—only one precipitate is ultimately formed, namely, aluminum hydroxide. Of course other precipitates may be produced, such as the phosphate, some of the more insoluble alums, etc.; but the tendency toward the making of this aluminum hydroxide is certainly remarkable. Study will show that some of these cases of the precipitation of this hydroxide are evidently of 'secondary' production; such as the result from alkaline sulphides, and carbonates (aluminum sulphide being stable only in the dry state, and simple carbonates not being known); but this aluminum hydroxide itself shows one of the best-known instances of solution ambiguity. To illustrate: Suppose that one starts with a solution of common alum; firstly, the aluminic atom is playing the part of a base, being held as such by the uncompromising sulph-anion, SO_4. Secondly, let us add sodium hydroxide to slight excess, until the alumic hydroxide is pretty fully precipitated; the aluminum hydroxide is now precipitated by a base; a base is serving as its proxy with the solution-tension of the sulph-anion, from which anion the aluminum hydroxide is now entirely disconnected. Thirdly, let us add sodium in excess, and till the aluminum hydroxide, precipitated *as* a base and *by* a base, is now dissolved *in* the base. What is the uncompromising sodium hydroxide doing with the aluminum ion? Sodium aluminate, or perhaps met-aluminate, has been formed, a salt in which the aluminum ion is acting as the acid residue, as though from the acid, H_3AlO_3, or $HAlO_2$. Fourthly, let us add to the strongly alkaline solution some strong acid, as dilute sulphuric or hydrochloric acid, and only to incipient acidity; a precipitate appears, H_3AlO_3, or $HAlO_2$, caused by an acid, and, therefore, the aluminic hydroxide is made to act the part of an acid. Fifthly, let us add the acid in excess, and till the aluminic hydroxide, just precipitated as an acid, is redissolved by the uncompromising sulphuric or hydrochloric acid, which, of course, forces it to act as a base. The chemical teasing of the aluminic ion has gone the round from basic to acid relation, and back again. The case is not isolated, several of the other metals showing a similar ambiguity. It thus appears that aluminum may act as a base with strong acids; or as an acid with strong bases. Doubtless it exerts its own part in the mutual action and re-action; but we speak of it in the language of the phenomena observed. As compared with aluminum, silicic acid is decidedly more acid; and calcium, magnesium and ferrous iron are decidedly more basic. But this is in water solution; and it is known that aluminum can show qualities in the state of dry fusion which are quite different, as shown by the stability of its sulphide.

But let us look at the mineralogy of alumina. The spinel series is ample proof that aluminum can play the part of an acid; and in this respect it is closely followed by ferric iron, manganic manganese and chromic chromium. Chrysoberyl also, $Be(AlO_2)_2$, is an illustration of the same quality. Native alumina, as corundum, is so common that it needs only to be mentioned. Coming to the simple silicates of alumina, it is significant that there is no simple meta-silicate, $Al_2(SiO_3)_3$, nor any simple ortho-silicate, $Al_4(SiO_4)_3$. The peculiar allotropic group (following the general formula, Al_2SiO_5), is remarkably well represented by the minerals, andalusite, sillimanite and cyanite. There is not sufficient evidence as yet to venture any certain view as to the structure of these minerals. Any formula must regard part of the oxygen as 'basic'; but we do not know whether of the type, $(Al_2O)SiO_4$, or $(AlO)_2SiO_5$, the former being a basic ortho-silicate, and the latter being a basic meta-silicate. It is possible that both formulæ may be represented respectively by the various members of the group. But when we come to the double- or alumino-silicates, both ortho-silicates and meta-silicates are found in mixture. The alumino-silicates comprise some of the most characteristic minerals known. Simply to enumerate the pyroxenes and the amphiboles, the garnets, the feldspars (and their geological kin, the scapolite group), the zeolites, the epidote group, the tourmaline group, the mica group, the clintonite group, the chlorite group—evidently we have met with a phenomenon which is too large to be ignored. This property of forming double salts, with the aid of silica on the one hand, and with some base, such as one of the alkalies, the alkaline earths, or similar dyad bases, on the other hand—this is a mark of alumina. So the conception begins to assume shape; the appearance of ambiguity here merges into the ability to unite with many salts; and it does not avail to ask too particularly as to the exact position of alumina in its many-sided part. The growth of a new idea is slow, and it takes time to apprehend it; but it is specially difficult when the facts are old and lie on the border between two distinct fields.

One can illustrate this to perfection by drawing on the chemistry of carbon. If we read the papers published forty or fifty years ago, we find much obscurity regarding substances which were both acid and basic at the same time. This is no jest, but the soberest certainty; the illustrations are the hydroxy-acids of the paraffin series as glycolic, malic, tartaric, etc. Now, it took a long time for chemists to realize that one side of a molecule might exert acid properties, at the same time that another side is exerting basic properties. This statement which is perfectly familiar to students of organic chemistry, may sound strange to metallurgists; and they will naturally ask why it happens that, if the same substance is both acid and basic, it does not neutralize itself? They will also be met by the sufficient answer of a reference to the lactones, which have done just this; for this always happens when the reacting groups (the acidiphanous hydrogen of the carboxyl group and the basiferous hydroxyl of the alcohol group), are as far away from each other, in the carbon chain, as the 'gamma position.' But in the carbon compound, there are several atoms of carbon, one of which may be in a highly reduced condition, while another is in a highly oxidized condition; and the reduced residue may act the rôle of an alcohol, in one part of the molecule, at the same time that the oxidized residue, in another part of the molecule, is acting the part of an acid. No wonder that it took the organic chemist scores of years to grasp the fact that these hydroxy-acids are basic acids; nor that it took him still longer, to learn how to handle one part of the molecule at a time, putting the other part to sleep, as it were. The incredulity with which many will read this statement is natural, albeit it is sober history. No wonder that organic chemistry should prove so fascinating to her devotees; and no wonder that, comparatively, inorganic chemistry should appear dark and forbidding; but what is needed is that the lessons and analogies of organic chemistry should be carried over to the field of inorganic chemistry. Some time a beginning will be made in the structure of the molecule in the solid state.

If one should make out a list of the kinds of ambiguity encountered in the whole field of chemistry, he would find it a long one. I do not refer simply to inactivity; but to the veiled character which substances have, even when they have been tempted to their suitable reactions. Thus to be specific, the only common anhydrides known in inorganic chem-

istry are: (1) The acid anhydrides, as silica, SiO_2, phosphoric anhydride, P_2O_5, etc.; (2) the base anhydrides, as quicklime, CaO; and (3) (not to forget the chiefest) any salt of any oxygen acid is the anhydride of the respective acid with the respective base (the great reaction of chemistry). But in organic chemistry, the anhydride list might be indefinitely extended, from the ethers to the acid-amides, and from the lactones to the lactams and lactims.

In other words, in the field which is most clearly understood, the kinds of ambiguity are many; and it is possible that the atom of such a two-sided thing as aluminum may be capable of playing several parts, none of them very well defined at present. There is no calcium spinel in nature; yet calcium and aluminum unite abundantly in the various alumino-silicates. Now, if we cannot define the behavior of aluminum in any of the alumino-silicates, what is the use of attempting to define it in a fused slag, provided only that we keep the charge within the limits of safe melting.

There is need here of some new conception, some more refined and more subtle thought regarding the molecular balance. It is a common remark of chemists that the acid and basic relations shade into each other; yet it is by no means pleasant to be becalmed in this region of negative relation. Doubtless there are plenty of open channels of attack, notably the long neglected study of volume, which should now be advancing rapidly in view of the new, and refined, methods of taking specific gravity. The thermo-chemical methods also promise much. It is no accident that this element (which exhibits several anomalies, such as the peculiar displacement of the atomic volume), should give off such an enormous amount of heat in falling from the state of the free metal to that of the 'sesqui-oxide,' Al_2O_3, which reaction is now used commercially in the heat mixture, thermite.

The view advanced here is that the alumina of slags is neither in suspension, nor is it distinctively in the state of acid or base; but rather that it is chemically combined with acids and bases in definite forms, as illustrated by the hundreds of alumino-silicates of the mineral world. That there may be many kinds of this ambiguity of aluminum is quite possible; but as long as we can not define the precise state and action of the alumina of a pyroxene or a garnet, it would be idle to attempt an accuracy that could be only aimless.

F. W. Clarke has shown the possibility of writing the formulæ of many of these with the aluminum in constant linking to the silicon, and always through oxygen. Though the formulæ are hypothetical, though there are no molecular weight determinations to guide one in limiting the actual size of the molecules, though knowledge of the reactions is but scant—yet in spite of all these weaknesses, there is a residue of proof that is certainly impressive. The large number of molecules that can be so represented, the abundant comparisons between original and alteration minerals, the ability of the formulæ to represent some relations that are common and constant—all this must mean something. One characteristic of the formulæ may be studied in detail; it is illustrated by the somewhat complex grouping:

$$Al\begin{cases} O—Si(OM)_3 \\ O—Si(OM)_3 \\ O—Si(OM)_3 \end{cases}$$

The remarkable feature of these alumino-silicate types is that they match the analysis; they represent the alumina as being linked to the silicon, through oxygen (in the example taken after the ortho-silicic type). Now, this relation of the alumnic oxide to the silicon may be of two modes. Firstly, the oxide of aluminum may possess a certain latent acidiferous or basiferous property; and this may exert an influence resulting in the strangely abundant occurrence of this alumino-silicate union. To illustrate this, let us go back to fundamentals.

There are four kinds of acid and basic properties, namely: (1) The actively (and inherently) acid property, illustrated by fluorine in HF, or by chlorine in HCl; here the F and Cl are inherently acidiferous by virtue of their own properties, and without the assistance of any outside help, as from oxygen (which appears in the next variety). (2) The passively acid property, illustrated by nitrogen in HNO_3, or by sulphur in H_2SO_4; here the N and the S are the nuclei of strongly acid residues, because they are strongly oxidized by the accumulation of oxygen about them. (3) The actively (and inherently) basic property, illustrated by sodium in NaOH, by potassium in KOH, by calcium in $Ca(OH)_2$, by scandium in $Sc(OH)_3$, and by thorium in $Th(OH)_4$ (the last being a base in spite of its being in the fourth degree of oxidation, an unparalleled case of inherent basic property). But the common feature of all in this group is that they are by nature basic, without the assistance of any helper, (such as hydrogen which appears in the next group). (4) The passively basic property, illustrated by the nitrogen in NH_4OH, and in the ammonium derivatives in general. Here the nitrogen is not basic enough to serve alone as a base; but the influence of the hydrogen accumulated in the molecule, comes out in the wonderfully changed condition of nitrogen in ammonia, as compared with the condition of nitrogen in nitric acid; indeed, the comparison of ammonia and nitric acid is evidence to the fact that nitrogen is ambiguous inherently.

The whole field of chemistry is filled with illustrations of the classification of property as outlined above. In some cases, we find what are supposedly weak elements actually serving as oxidizers of other and stronger atoms; thus in the cyanide series, we discover nitrogen in intimate union with carbon; and strangely enough, at one moment the nitrogen seems to be the oxidizer of the carbon, and the next moment it is *vice versa*, as shown by the normal and iso-cyanides. And it may be that there are normal- and iso-alumino-silicates.

Now, after the analogy of the acid and basic properties, as given above, it is fair to ask whether the aluminum and silicon may not oxidize and re-enforce each other, so that the total latent acid property of both may be concentrated and accumulated in either one, or may be directed as though from one chemical center of gravity. Certainly, the remarkable abundance of the grouping, whatever it may be, is not accidental. It indicates a stability of union that seems to be almost supreme in the non-metallic mineral world.

Secondly, there is also another phase that may enter in the explanation. It may be illustrated by what appears to be a basic double-carbonate of potassium and aluminum:

$$K—O—\underset{\underset{O}{\|}}{C}—O—Al=O,$$

though the simple carbonate of aluminum is unknown. It seems as though the strongly basic influence of the potassium atom, in some way, either intensifies the opposite, but weak, carbonic acid residue, so that it can hold the alumino-residue; or, perchance the polarizing action of the basic potassium may extend through the carbonic residue, stimulating the alumino-group to a temporarily basic character; certainly, it is the presence in the molecule of the potassium atom that holds the weak carbonic- and alumino-residues together.

It is dangerous to pursue this line of speculation indefinitely; for there can be no question that tampering with electric charges and polarities of atoms and radicles has done infinite harm in the history of chemistry. At the same time, it is true that all the ascertained explanations of chemical action have been connected with the display of some form of electrical energy; and the influence of one atom or radicle on another is unquestioned, (as is shown in the increasing acidity of the mono-, di- and tri-chlor-acetic acids; or in the decreasing basicity of the mono-, di-, and tri-phenyl-amines). It matters little what form of symbolism the mind may use in picturing to itself the structure and action of the molecules; but it is necessary that one should always have his illustrations; in fact, one should use theory only as it may be demanded by fact already accumulated. When one is speculating, let him remember that he is speculating, let him distinguish fact from theory. "Der Versuch fundamental" (the fundamental

experiment), was the constant watchword of old Wöhler; his judgment was never clouded.

Now, although we do not find certain explanation, even in theory, we do find, by analogy, the same kind of explanation as that which has served so well in directing work along better known lines. The alumino-silicate nexus is a fact in mineralogy; and it is well represented in the translation of reaction and alteration, into the guarded language of the graphic formula, which observes the main points, and accounts for the valence relations.

Many other facts indicate that aluminum and silicon have a great field of reaction which has hardly been entered. In the periodic classification, both are in the region where the hydrocarbon or 'alkyl' derivatives are volatile. Moreover, silicon has an inclination to the style of atomic linking characteristic of hydrocarbons. Aluminum has some latent properties of its own. Note the heat of formation of corundum, Al_2O_3; it is 388.8 large calories, far exceeding the heat evolved by any other oxide. Let us translate these wonderful figures into clear understanding. When 54 grams of aluminum (twice the at. wt. of Al,27), unite with 48 grams of oxygen (three times the at. wt. of O,16), according to the formula, Al_2O_3, there is developed a quantity of heat sufficient to raise the temperature of 388,800 grams of water 1° C. at the ordinary room temperature. The amount is almost out of proportion, as compared with the heat evolution of the other metals and non-metals. It is a fact which must be connected with the tendency of the whole work of aluminum. It explains why it is that when aluminum is treated with some metallic mercury and mercuric chloride, it changes its apparent nature and wakes up to a chemical life which is comparable with the activity of sodium in the form of sodium amalgam. Aluminum in this stimulated form, cannot be kept in the air, nor with water which it rapidly decomposes; but it must be preserved under kerosene as in the case of sodium and potassium.

In summation of the evidence, there seems no reasonable doubt that the two semi-metals in the alumino-silico nexus in some way re-inforce each other in the natural silicates; and that they do the same thing in the similar compounds that float in the field of fusion of furnace slags. The alumina in the basic eruptive rocks will average about 12 to 15 per cent, which will compare favorably with the alumina in some of the slags; and the general characteristic of infusibility with increasing tenor of alumina, is a marked property both of natural and metallurgical aluminosilicates. The whole subject of the rôle of alumina sorely needs further investigation; but the general trend of action seems to be outlined by the occurrence and properties of the natural compounds. Moreover, hot fusion constitutes a field where virtual or possible ionization must influence the formation of the alumino-silicic residue.

Explosiveness of Coal-Dust.

In the discussion following a paper on 'Coal Dust,' by Mr. Jackson, at the last meeting of the Central Mining Institute of Western Pennsylvania, two interesting theories were advanced.

It has commonly been supposed that the presence of more or less fire-damp is a necessary adjunct to a dust explosion, serving to kindle the coal particles, and to communicate the combustion. The occurrence of authenticated dust explosions, however, in mines in which fire-damp is unknown, in coal bins and in other parts of surface works, and their frequent visitation of flour mills, all seem to indicate that the acccumulation of combustible dust should not be permitted in any circumstances. To sweep the finest dust from its main haulage ways, one mine has adopted the scheme of confining the air-current temporarily to the main courses, and then driving the ventilating fan under augmented pressure.

Upon closer consideration, however, it may be found that inflammable gas is really the communicating medium for combustion, even though its presence is not suspected. It is well known that coal, upon exposure to the weather, does lose some of its volatile constituents, even under ordinary conditions. Such emanation cannot fail to be hastened with a fine state of division, and at the high temperatures observed in some mines. The residual dust in an area through which an explosion has passed is invariably found to have been coked, and other evidences have pointed to the existence of an extremely high temperature, at which every particle of dust would have exhaled, instantly, its quota of inflammable and explosive gas. As for the primary cause of such an explosion, it will in most cases be attributed to the unconsumed and highly heated gases projected into a dust-laden atmosphere by a blown-out shot.

If this latter theory as to the propagation of a dust explosion be sound, it follows that liability to disaster varies with the proportion of volatiles in the coal, although the physical nature, too, exerts a marked but inexplicable influence.

A Long Tunnel.

In a recent number of the JOURNAL reference was made to a long tunnel which is now under construction in southern Colorado, as a part of the irrigation plan undertaken by the government. In that item the length was understated. The tunnel will be a little over 30,000 ft. in length, or nearly six miles. It will be the longest tunnel on this continent, and the longest irrigation tunnel in the world. The project includes the reclamation of a large area of arid land, and the results should be important to the State. We may repeat that the J. Geo. Leyner Engineering Works Company, of Denver, is furnishing the machinery for the drill work.

Books Reviewed.

Conversations on Chemistry. By W. Ostwald. Translated by Miss Elizabeth C. Ramsay. New York: John Wiley & Sons. Pages, 250. Price $1.50.

This is Part I of a series of popular treatises on chemistry, and deals with the facts of general chemistry. The style is clear and simple; the author is the well-known teacher of physical chemistry at Leipzig, and the translation and general book-making are all that could be desired. The little volume is recommended not only to those young students who are unable to secure regular school training, but also to those who are; to say nothing of the large circle of mature readers who like plain teaching, though it may be written primarily for the young. The book is heartily commended. We wish it the success it will enjoy in meeting the quick and ready demand that is waiting for it.

A Treatise on Friction and Lost Work in Machinery and Millwork. By R. H. Thurston. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. Pages, 425; illustrated. Price $3.

The author first discusses the laws of friction in every possible connection, analyzing its various phases and showing methods of calculating its value in all its ordinary occurrences. The lubricants are then classified and described, attention being called to their method of manufacture and to their peculiarities, by which the range of usefulness of each is defined. The author deprecates the tendency to replace the more fluid lubricants by the more solid, the apparent saving in the quantity used being offset by increased loss of power, a fact which is readily concealed. Solid lubricants—graphite, talc, etc.—are useful only in extremely heavy bearings, working at slow speeds.

One chapter describes the methods of applying lubricants to all kinds of bearings. The author's experiments show no difference as to amount of friction between bronze and babbitt bearings, but indicate that the white metal requires more copious lubrication to hold down the temperature.

A most important chapter is the one on the inspection and tests of lubricants. It gives a detailed system of chemical treatment, by which an unknown oil can be classified by name and origin, or a known oil can be tested as to its purity, and if found impure, the nature of the adulterant can be determined. Physical tests of viscosity and rate of drying follow.

The author's and others' researches into the friction of lubricated surfaces are assembled, and a method of computation is offered by which the relative financial economy in the use of one method of lubrication rather than another can be discovered. A statement of all the most recent work along this line ends the volume.

Geologic Atlas of the United States. De Smet Folio, South Dakota. Washington: Engraved and published by the Geological Survey. Three maps, six pages text.

This folio treats only of the water-bearing horizons in eastern South Dakota, from which the towns of De Smet, Iroquois and Carthage derive their supply. Geological information is only such as has been obtained from well-boring operations. The basal granite is overlain directly by the middle Cretaceous formations —Dakota sandstone, Benton shale, Niobrara chalk and Pierre shale, capped by a thick mantle of Glacial material.

Water is first met at the base of the boulder clay. In a few localities this water is under sufficient head to yield an artesian flow, but it usually has to be pumped, and is too strongly impregnated with salts to be useful. The next occurrence is in the Pierre clay, at a depth of 145 ft. This water is soft, but has to be pumped.

The Benton formation contains two water-bearing horizons, the upper affording the more copious supply. They are struck at depths of 380 ft. and 580 ft., respectively.

The Dakota sandstone furnishes the main source of artesian water, from four distinct horizons. This sandstone formation owes its efficacy to four facts: (1) Its wide extent, reaching from the Rocky mountains to Omaha; (2) its elevated western border, outcropping in a region of abundant rainfall and crossed by numerous streams; (3) the tightness with which its eastern border is sealed by the overlapping Benton and Pleistocene formations; (4) the lowering of the land surface by pre-Glacial erosion, so as to bring it below the hydraulic level of the water-bearing formation. A colored pattern map shows the depths at which this Dakota sandstone will be reached, and the areas within which artesian and pumping wells, respectively, may be expected.

Earth Dams: A Study. By Burr Bassell. New York; *Engineering News* Publishing Company. Pages, 72; illustrated. Price, $1.

Earth dams date far back in the history of the world, and are still the most generally used of all structures for controlling, or diverting, the flow of water. The writer of this study makes no claim to anything new; it is a study only, describing several important works of this class, and outlining the principles which have governed their design and erection. Though it is not intended to be a complete treatise, he has collected many important facts, and outlined the principles of construction in an interesting way. Especially in the chapters on preliminary studies and in his conclusions he gives valuable rules and data. Appended is a list of references and authorities for the use of those who wish to pursue the study of the subject further. A dam, or reservoir, is often a necessary adjunct to mining operations; and, the engineer in charge of such work will find much in this study which will be useful to him.

The Rio Tinto Mine: Its History and Romance. By William Giles Nash. London, England; Simpkins, Marshall, Hamilton, Kent & Company, Ltd. Pages, 236; illustrated.

A mine which is the oldest in the world still worked, and which has been a mine for over three thousand years, certainly has a history, and more or less romance is connected with it. No other mine has ever had so long a life. The great deposit of copper-bearing pyrite, known for twelve centuries back as the Rio Tinto, is still far from exhausted. Worked successively by Phœnician, Celtiberian, Carthaginian, Roman, Goth, Moor, Spaniard and Englishman, the mine reached its highest development only in recent years, and there is every prospect that it will be an important copper producer for many years to come.

The earlier history of the mine is lost, but there is evidence that copper obtained from its ore was an article of Phœnician commerce as early as 1100 B. C. Whether the native Celtiberians won the metal and sold it to the traders, or whether the Phœnicians were themselves the miners, is not certain; relics dug up in recent years seem to indicate the latter. The mine is known to have been worked during the Roman occupation of Spain, and copper was again taken from it after the Visigoths had expelled the Romans. The Moors also knew its deposits and used them in rather a desultory way, for they knew little of mining. In the troubled times after the expulsion of the Moors work was abandoned for nearly a century, and its reopening, about the year 1500, was almost a re-discovery. The mine was then government property, and was operated only irregularly for a time. Keen and resolute prospectors and miners of the precious metals as the Spaniards showed themselves to be in Mexico and South America, they were never very successful with the commercial metals, and the best periods of the Rio Tinto in the seventeenth and eighteenth centuries were under the respective managements of Wolters, a Swedish metallurgist; Tiquet, a French engineer, and Lady Maria Theresa Herbert, an Englishwoman who obtained a lease for herself and her associates. In the early years of the nineteenth century the mine was abandoned during the French invasion and the following wars. From 1815 on it was worked, first by the government and then by various lessees, until 1873, when it was sold to Matheson & Company, of London, for 92,800,000 *pesetas*—about $18,500,000. They at once organized the present Rio Tinto Company, and the really systematic exploitation was begun. The change in methods is shown by the records; in the ten years 1863-1872 there were reported 640,000 tons of pyrite mined, yielding 10,193 tons of copper, while in the ten years 1893-1902 the totals were 15,800,000 tons of pyrite and 208,834 tons of copper.

Mr. Nash has had access to documents not available, or not known, until recently. He tells the history of this ancient and notable mine in rather a dry way, with only occasional illuminations of fancy or imagination, which would not have been out of place. In the main, however, the work is well done, and it makes an interesting story.

The Field Practice of Railway Location. By Willard Beahan. New York; *Engineering News* Publishing Company. Pages, 252; illustrated. Price, $3.

The object of this book is to record the methods commonly used in the location of railroads in the United States, especially in the West. Little has been written in a permanent form on these methods, and the descriptions here given contain much that cannot be readily found in printed form. The late Arthur M. Wellington's monumental work on 'The Economic Theory of Railway Location' has stood a test of fifteen years, and is still the highest authority on the theoretical side; Mr. Beahan constantly refers to it in his book. This is intended, however, to cover the practical side, the actual work of location, and its object is well carried out. To young engineers its directions and records of experience will be extremely useful; while those of more experience will find a great deal in it which will help them and serve for reference. The author has made free use of the experience of others, as well as of his own, and he has done it in a practical and interesting way.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Poor's Manual Appendix. Special Edition. New York; Poor's Railroad Manual Company. Pages, 240.

Earth Dams: A Study. By Burr Bassell. New York; *Engineering News* Publishing Company. Pages, 72; illustrated. Price, $1.

Mathieson's Record. 1905. Compiled by F. C. Mathieson & Sons. London, England; Effingham Wilson. Pages, 88. Price (in New York), $1.75.

Records of the Geological Survey of New South Wales. Volume VII. Part IV. Sydney, N. S. W.; Government Printer. Pages, 88; with maps and plates.

The Field Practice of Railway Location. By Willard Beahan. New York; *Engineering News* Publishing Company. Pages, 252; illustrated. Price, $3.

Elements of Mechanics. By Mansfield Merriman. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 172; illustrated. Price, $1.

Development of the Lake Superior Copper Mines during 1904. By Arthur L. Carnahan. Houghton, Mich.; Published by the Author. Pages, 36. Price, 50 cents.

A Manual of Mining. Fourth Edition. By M. C. Ihlseng and Eugene B. Wilson. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 724; illustrated. Price, $5.

Electric Lighting. Volume I. The Generating Plant. Sixth Edition. By Francis B. Crocker. New York; D. Van Nostrand Company. London; E. & F. N. Spon, Ltd. Pages, 492; illustrated. Price, $3.

Transvaal Mines Department. Report of the Government Mining Engineer for the Year Ending June 30, 1904. U. P. Swinburne, Government Mining Engineer. Pretoria, Transvaal; Public Printer. Pages, 200; with maps and tables.

Industrial Education and Industrial Conditions in Germany. Special Consular Reports. Volume XXXIII. Prepared by the Bureau of Statistics of the Department of Commerce and Labor. Washington; Government Printing Office. Pages, 324; illustrated.

United States Bureau of Fisheries. Bulletins. No. 562. Utilization of Seaweed in the United States. By Hugh N. Smith. Pages, 50; illustrated. *No.* 563. *The Functions of the Lateral-Line Organs in Fishes.* By G. H. Parker. Pages, 26. *No.* 564. *Isopods from the Alaska Salmon Investigation.* By Harriet Richardson. Pages, 16; illustrated.

Bulletins of the United States Census Office. Asphaltum and Bituminous Rock. By Joseph Struthers. Pages, 8. *Bauxite.* By Joseph Struthers. Pages, 6. *Borax.* By Joseph Struthers. Pages, 8. *Graphite.* By Joseph Struthers, Pages, 8. *Magnesite.* By Joseph Struthers. Pages, 4. *Mineral Pigments.* By Joseph Struthers. Pages, 8. *Phosphate Rock.* By Joseph Struthers. Pages, 12. *Quicksilver.* By Joseph Struthers. Pages, 10. *Sulphur and Pyrite.* By Joseph Struthers. Pages, 12. Washington: Published by the Bureau of the Census.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Acid Salt Cake Process.

Sir—Some time ago we noticed in your valuable JOURNAL an item regarding the treatment of zinc tailing at Broken Hill by the acid salt-cake process, in which the statement was made that they were meeting with difficulty in disposing of the concentrate in Europe. Being interested in knowing the facts, we communicated with our Sydney correspondent, Mr. R. A. Hervey, who in turn took the matter up with the manager of the Broken Hill Proprietary Company. Mr. Hervey forwards us a letter from the general manager, Mr. Delprat, from which we quote as follows:

"Although I noticed a paragraph in a newspaper on this subject, the information must have been supplied by someone either much misinformed, or interested in other directions. We have never had any complaints of any residue being left in the zinc concentrate, nor is there any residue left in this concentrate; nor have we any difficulty in selling the product."

We are not, in any way, interested in the exploitation of this process, although we are vitally interested in all questions which pertain to saving the values in metalliferous ores, and it was to ascertain the facts in the matter that we took it up, as indicated above.

AMERICAN CONCENTRATOR COMPANY.

Joplin, Mo., Feb. 20, 1905.

A Mining Engineer's Exchange.

Sir—All who are reasonably informed must recognize the exacting requirements on mining engineers for technical skill and scientific information. Unfortunately, a question pertinent to many mining examinations is, not the skill of the engineer or the economic geologist, but will this or that person's report influence the investment of money? This is what the mine-owner considers first, and mining engineers are frequently at a loss to know how their patrons may be efficiently served. It is evident that a mining engineer cannot sell shares for his clients, yet many of them think that he should be able to do so. If a medium could be found which would enable a mining engineer to be of service to his clients in this capacity it would be of great usefulness, especially to the public, who would buy mining shares freely if they could be assured that they were buying a chance in an actual property, backed by legitimate effort.

I am of the opinion that such a medium can be found, and suggest that it would be desirable to form an organization, to be known as the American Mining Engineers' Stock Exchange. It should consist of, say, 500 members, each member contributing a small amount per year, which would enable the organization to maintain a central office, from which to push the sale of such mining stocks as might be recommended by the members. Further, a trading room might be maintained in different cities by appointing members to represent the proprietors, each engineer in the organization having the right to appoint such representatives.

There are hundreds of brokers who are looking for representative stocks to sell. People buy mining stocks and want to buy them, and if an organization were formed through which mining engineers could speak to the people, it is certain that buying would follow, where now an outlet for mining stocks can be had only by the dishonorable means of over-valuation in the prospectus, backed by liberal advertising.

It would certainly be a good thing for each one of the 500 engineers who might own a membership in an organization to sell shares in such mining companies as they might recommend. In time these memberships would become very valuable, and an engineer owning one would be in a position to command the attention of mine-owners, because at his recommendation stocks of properties which he might have examined would be admitted to the exchange.

To perfect an organization it would be only necessary to bring together the different parties who could be of service. The people want to buy mining stocks; give them a medium through which they can make purchases and know that they are buying property of merit, and they will buy liberally. Brokers are willing to trade in mining stocks; give them a medium for securing public attention, and their services will be eagerly offered.

By forming an organization such as I have outlined, mining engineers can control an outlet for legitimate mining stocks, and can, to some extent, check the miserable swindling in advertised mining stocks which tends to put discredit on mining.

I have at hand all the elements which could be combined to form a strong institution, and I hope the matter may be discussed through your valuable JOURNAL.

FRANCIS C. NICHOLAS.

New York, Feb. 19, 1905.

In extracting alkali from rocks, Clark has found that when the mineral leucite, with its 21% potassium oxide, is heated with ammonium chloride, the potassium is converted into chloride and is easily separated from the melt. If this reaction could be extended to orthoclase and the ammonia recovered by treatment with lime, the enormous quantity of potash contained in this mineral would be at our service.